MISC - Army

REPORT OF PROCEEDINGS of the

ARMY AVIATION INSTRUCTORS' CONFERENCE.

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1968

UNITED STATES ARMY AVIATION SCHOOL

FORT RUCKER, ALABAMA

036 450

DEPARTMENT OF THE ARMY
ARI FIELD UNIT, BENNING
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FOR THE CHIEF:

ALEXANDER NICOLINI
Major, Infantry
R&D Coordinator

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*The CLASSIFIED portion of this report has been withdrawn and compiled into a CLASSIFIED supplement.

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CENTER/SCHOOL BRIEFING

Gentlemen, ~~this~~ THIS is a short briefing which is designed to familiarize you with Fort Rucker and to give you a general knowledge of the activities which are conducted ~~here.~~ THERE.

Fort Rucker is located in what is called the Alabama Wiregrass area. The Wiregrass is comprised of five counties which surround the post. Fort Rucker is about 100 miles from Fort Benning, Georgia, the home of the Army Infantry Center. We are about the same distance from Maxwell Air Force Base where the Air War College is located. Over to the southwest about 120 miles is the Naval Air Training Center of Pensacola. We are about 90 miles from the Florida Gulf Coast. As you can see, Fort Rucker is in the middle of quite a bit of military air activity.

Fort Stewart is the largest Army installation east of the Mississippi River. It is reported that when the Army purchased over 280,000 acres of land in 1940, the reservation was approximately 39 miles across from east to west and 19 miles from north to south. Hunter Army Airfield borders the city limits of Savannah with a population of over 200,000 and encompasses 5,400 acres of land. Even though Hunter and Fort Stewart are approximately 30 miles apart, the boundaries of the two facilities are only 12 miles apart.

Fort Rucker has a post population of over 27,000. There are some 4,500 students in residence at the present time. Two thousand of these students are involved in flight training. There are also quite a few civilians employed on post.

Fort Rucker is continuing to grow, and many new buildings are being built or being planned. Construction has already begun on a new high rise BOQ, and it is expected to be completed by November of 1968. A proposed headquarters building is now in the planning stage, and when completed it will house all the post headquarter's staff, all department headquarters, an auditorium, and ten to twelve classrooms. A proposed community service center is still in the planning stage; however, the commissary is under construction at the present time, and the bowling alley has been in operation for some time now.

The Aviation Center and Aviation School are concerned primarily with teaching and training in Army aviation while these other five organizations at Fort Rucker are all study, research, or testing activities.

The Aviation School comes directly under the Continental Army Command for academic matters while the Center comes under Third United States Army for administration and logistics. (See figure 1)

At Hunter Army Airfield we have acquired the finest aviation maintenance complex found at any Army installation. We have available for maintenance over 285,000 square feet of hangar space. All of the aircraft stationed there can be stacked inside the hangar in the event of extreme weather conditions, thus negating a fly away or evacuation plan. Ramp area consists of 117 acres of 30 inch reinforced concrete.

Buildings located inside the fenced flight line area have been converted into classrooms and briefing rooms. This hangar is used as the synthetic flight simulator building and houses 42 trainers. Many of the classroom buildings are equipped with the most up-to-date instructional aids available to include a closed TV circuit. At Hunter sufficient permanent constructed classroom buildings were available to convert to the 14 classrooms and 14 briefing rooms needed in the rotary wing program. All of the 50 man classrooms have front and rear projection screens, magnetic boards, chalk boards, and provisions for closed circuit TV.

At Fort Rucker there are enough family quarters units to accommodate over 1,500 families on the post.

The permanent structure at Fort Stewart consists of 593 sets of family housing. Adjacent to the family housing area is an 18 hold golf course and the dependent school. There is an approved program to construct an additional 120 units of enlisted quarters.

General Meszar at Hunter wears two hats in that he is over the US Army Garrison, which provides support for the Aviation School element and is also Commanding General of the US Army Flight Training Center. He reports to the Department of the Army through US Continental Army Command and Third US Army headquarters on administrative and logistical matters as Commanding General of the Flight Training Center, and he reports through General Oden on academic matters as Deputy Commandant of the US Army Aviation School.

General Oden at Fort Rucker wears three hats. He is the Commandant of the US Army Aviation School; he is Commanding General of the post; and he is the CONARC commander's executive for all Army aviation training. The major organizations under the Center are the hospital, US Army Aviation School Regiment, which houses the students, staff and faculty and the 53rd Aviation Battalion, which is the school's support unit. The Aeromedical Research Unit comes directly under the Surgeon General located at Department of the Army. The Aviation Test Board is a part of the Army Materiel Command and comes directly under the Test

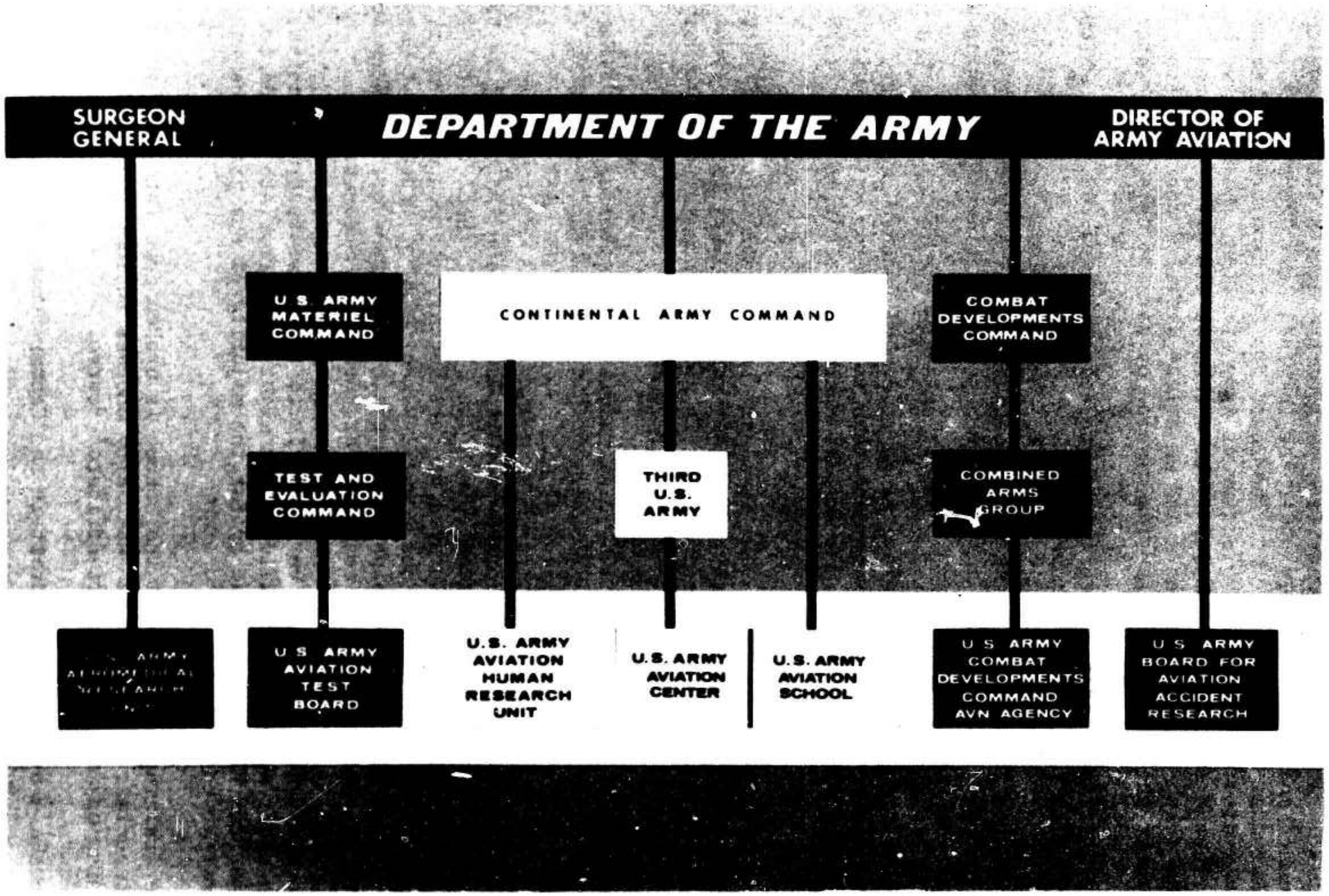

Figure 1. Command Relationship of Fort Rucker

and Evaluation Command. The Human Research Unit comes directly under CONARC. The Aviation Agency is a part of the Army's Combat Developments Command and comes directly under the Combined Arms Group which is located at Fort Leavenworth. The Board for Aviation Accident Research comes directly under the Director of Army aviation. Although we have different chains of commands, so to speak, we are all interested in the same thing - Army aviation - and we effect detailed coordination right here at the working level. The mission of each of these units are:

The Aviation Test Board tests and evaluates the new equipment which we are going to get in the inventory.

The Board for Aviation Accident Research monitors all Army aviation accidents. They receive information here from accidents occurring all over the world.

The Aviation Agency is a long range study and research activity. They conduct studies to determine such things as how Army aviation will be organized, equipped, and how it will operate in the time frame 1975 to 1980.

The Aeromedical Research Unit is also a study and research activity which is concerned primarily with the medical aspects in Army aviation. They maintain close liaison with their counterparts in both the Navy and the Air Force.

The Human Research Unit is a joint military and civilian scientific group which is concerned primarily with the human factors in Army aviation.

The primary function of Fort Rucker is the Aviation School and is the largest organization located here. The Aviation School consists of the school proper, which is located at Fort Rucker; the school element, located at Fort Stewart; and a small school element, located at Keesler Air Force Base in Mississippi. ATC training is conducted at Keesler, while flight training is conducted at Rucker and Stewart.

The mission of the Aviation School is to train aviators, mechanics, and other aviation specialists. It might be appropriate to add to this "for Vietnam" because by far the majority of our graduates go straight to Vietnam.

The training conducted at the school is broken down into four general categories. The officers' specialty courses include the Flight Surgeon's Course and a Vietnam staff officers' course.

There are over 1,100 aircraft in the Center/School fleet. There are

many varieties of aircraft in the fleet, and there are approximately 50 other aircraft located at Fort Rucker which belong to Class II Activities.

The aviation training conducted by the school extends well beyond the limits of the military reservation. There are five aerial gunnery ranges at Fort Rucker. There are four basefields for helicopter training and one basefield for fixed wing training. There are over 300 flight training sites in the local training area.

Cairns Army Airfield is the basefield for fixed wing training. It is one of the busiest airports in the nation. The headquarters of the US Army Aviation Test Board is located at Cairns. There are about 220 aircraft based at Cairns, and it is the site of our radar approach control. The Cairns RAPCON controls all air traffic passing through the Fort Rucker area below 5000 feet on IFR flight plans. This includes civilian as well as military aircraft. The largest aircraft that Cairns is capable of accepting is the Jet Star.

There are 200 helicopters based at Hanchey Heliport.

At Lowe Heliport one can see from the runways that it was originally a fixed wing airfield, but it was converted to a heliport because of the big increase in helicopter training. In addition to the maintenance facilities at our basefields, we have some classroom facilities. Some of the ground school instruction is conducted right at the airfields. Lowe has some 270 helicopters.

Shell Heliport is located over by Enterprise. There are 150 helicopters based at Shell, and it was also originally a fixed wing airfield.

Our newest basefield is Knox Army Heliport. There 100 helicopters based at Knox, and we have had it in operation since January of this year. Knox was originally just a regular training stagefield. We added a maintenance hangar and some parking places and made a basefield of it. Because of an increase in training loads for FY68, additional construction is necessary. An emergency FY68 MCA construction requirement is being processed to provide the additional facilities. One of these is to construct an adequate control tower. The control tower now being used is too small and does not provide adequate vision to control the air traffic.

At Hunter/Stewart, we again extend well beyond the limits of the military reservation. Besides the major airfields, there are four rotary wing stagefields, 80 confined areas, and eight pinnacles. The main field is Wright Army Airfield, which is the basefield for fixed wing training at Fort Stewart. Two new 2,900 foot runways have been constructed to

increase the capability of the previous two 5,000 foot runways. Additional parking ramps, maintenance facilities, and classrooms have also been added.

Hunter Army Airfield is the basefield for rotary wing training at Hunter. Hunter was formerly an Air Force base. It has 285,000 square feet of hangar space, and the ramp area consists of 117 acres of 30 inch reinforced concrete. Evans Army Heliport is five miles east of Wright Army Airfield. The complex is self-contained, having maintenance facilities, mess hall, and classrooms.

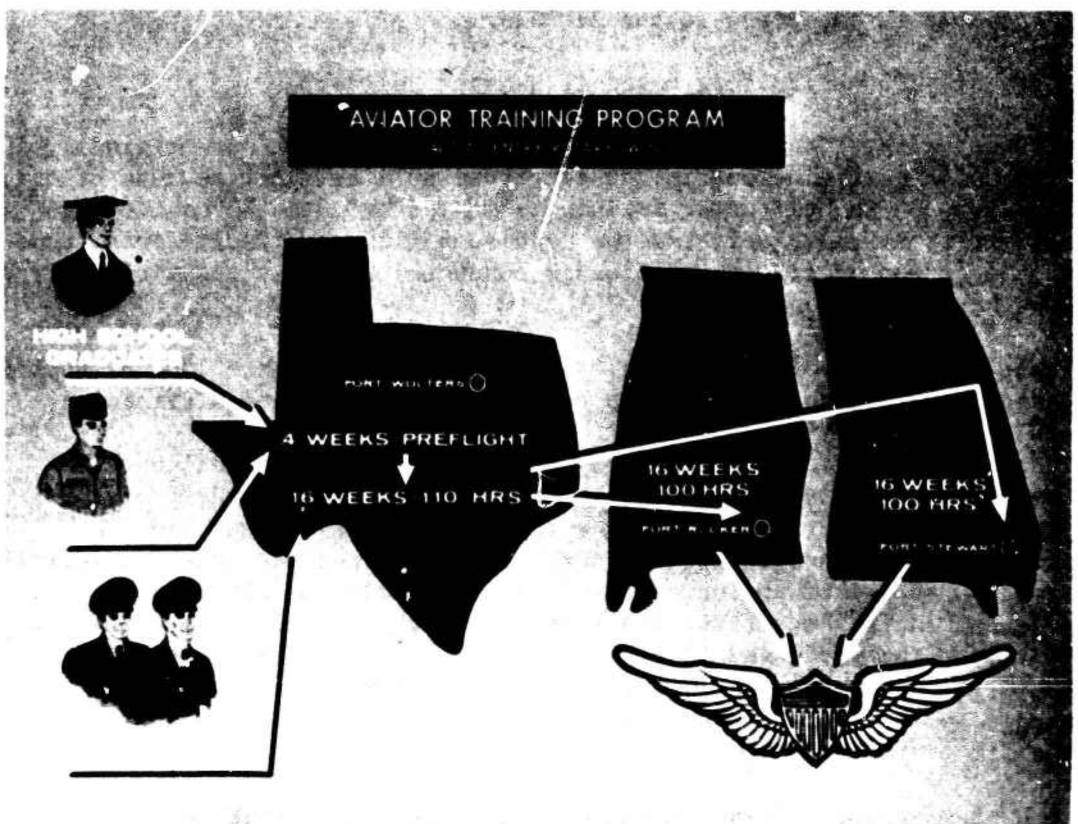

Figure 2. Initial Entry Rotary Wing Course

As I mentioned before, we have four categories of training. Outlined in figure 2 is our Initial Entry Rotary Wing Course. This is where we take a fellow who doesn't know how to fly anything and teach him how to fly a helicopter. We get the students from the four sources as shown in figure 2. High school graduates can enlist in the Army for the express purpose of attending flight school. He comes into the Army, undergoes eight weeks of infantry basic training and then reports in to Fort Wolters, Texas, where he receives four weeks of pre-flight training. The enlisted men on active duty who are selected also go into the four weeks of pre-flight. When they have completed the four weeks of pre-flight, then they enter 16 weeks of flight training at Fort Wolters. The officers and warrant officers go straight into the flight program. When they have successfully completed the 16 weeks of flying at Fort Wolters, then they come to Fort Rucker or Fort Stewart where they receive an additional 16 weeks.

When the student reports in to Fort Wolters, he enters what we call the primary phase, which is an eight week phase conducted by a civilian contractor. The second eight weeks at Fort Wolters is given by the military. During this 16 weeks of training at Fort Wolters, the student will fly either the TH-55, the OH-13, or the OH-23.

The student goes out and practices his approaches, landing, and takeoffs from one of our helicopter stagefields. Three helicopters will use each lane, and 15 helicopters can use the stagefield at the same time. The concrete pad in the center is where the aircraft can come in and be refueled, and also where the instructor pilot can switch students. The control tower is located approximately in the center of the field. Right behind the tower is a small briefing room.

When the student successfully completes this 16 weeks, he will then come to Fort Rucker and enter the tactical instruments phase. This is an eight weeks course. Four weeks of it is given by a civilian contractor, and four weeks given by the military. During this phase the student may fly either the TH-13T or UH-1.

When the student completes his instrument phase, he then enters the advanced contact training phase. This is a four weeks phase given by the military. The purpose of this phase is to transition the student into the UH-1 After he receives 25 hours in the UH-1, he enters tactics, which is the last phase. This phase consists of four weeks of training which is geared toward a subsequent assignment in Vietnam. All the instructors in this phase are Vietnam veterans. During this phase, the students operate out of tactical base fields. Here the student receives air mobile training and learns to carry troops on realistic combat assaults.

In summary, the initial entry rotary wing student receives 32 weeks of training and 210 flying hours. Sixteen weeks of this is conducted at Fort Wolters, and 16 weeks is conducted at Fort Rucker or Fort Stewart. The student input has greatly increased in this course.

There are transition courses into which some of these students may be scheduled:

The CH-47 Transition and IP Course is conducted at Fort Rucker. The "Chinook" is the Army's medium cargo helicopter with a 16,000 pound capacity and an airspeed of 130 knots. Input 22, Total 650.

The transition course for the CH-54 "Crane" is also conducted at Fort Rucker. This course is six weeks, two and one-half days in length with 22 flight hours. The "Crane" is the Army's heavy cargo helicopter with a capacity of just under 20,000 pounds. It has an airspeed of 110 knots. Input 14, Yearly 110.

The AH-1G (Cobra) Pilot Transition Course is four and one-half weeks long, and the student aviator receives 25 hours of flight training.

In acquiring Hunter we received a "natural" for parking and security of the Cobra. It is an old Air Force SAC alert area. This area is adjacent to the ammunition storage area, is completely enclosed, and has facilities for classrooms, housing, and feeding assigned personnel.

In addition to the Initial Entry Course, we have other helicopter training courses, one of which is the Qualification Course where we take a fixed wing pilot and teach him to fly the helicopter. We also have transition and other courses, as mentioned already.

The Initial Entry Fixed Wing Course is organized along the same lines as the Initial Entry Rotary Wing Course, as you can see in figure 3. Sixteen weeks of training is given at Fort Stewart, Georgia, and the last 16 weeks is given at Fort Rucker. When the student reports in to Fort Stewart, he starts flying the T-41. His first eight weeks, which is Phase "A" is given by a civilian contractor. The fixed wing stagefields used have parallel runways which are 2,600 feet, and 14 aircraft can remain in the pattern shooting takeoffs and landings.

When he completes Phase "A", the student enters Phase "B" which is eight weeks long and given by the military. The student is still flying the T-41, but he will be operating from a "B" Phase stagefield where the runways are 1,000 feet long, and only 10 aircraft can use the field at one time. When he completes this 16 weeks, he then comes to Fort Rucker where he enters the Instrument Phase "C".

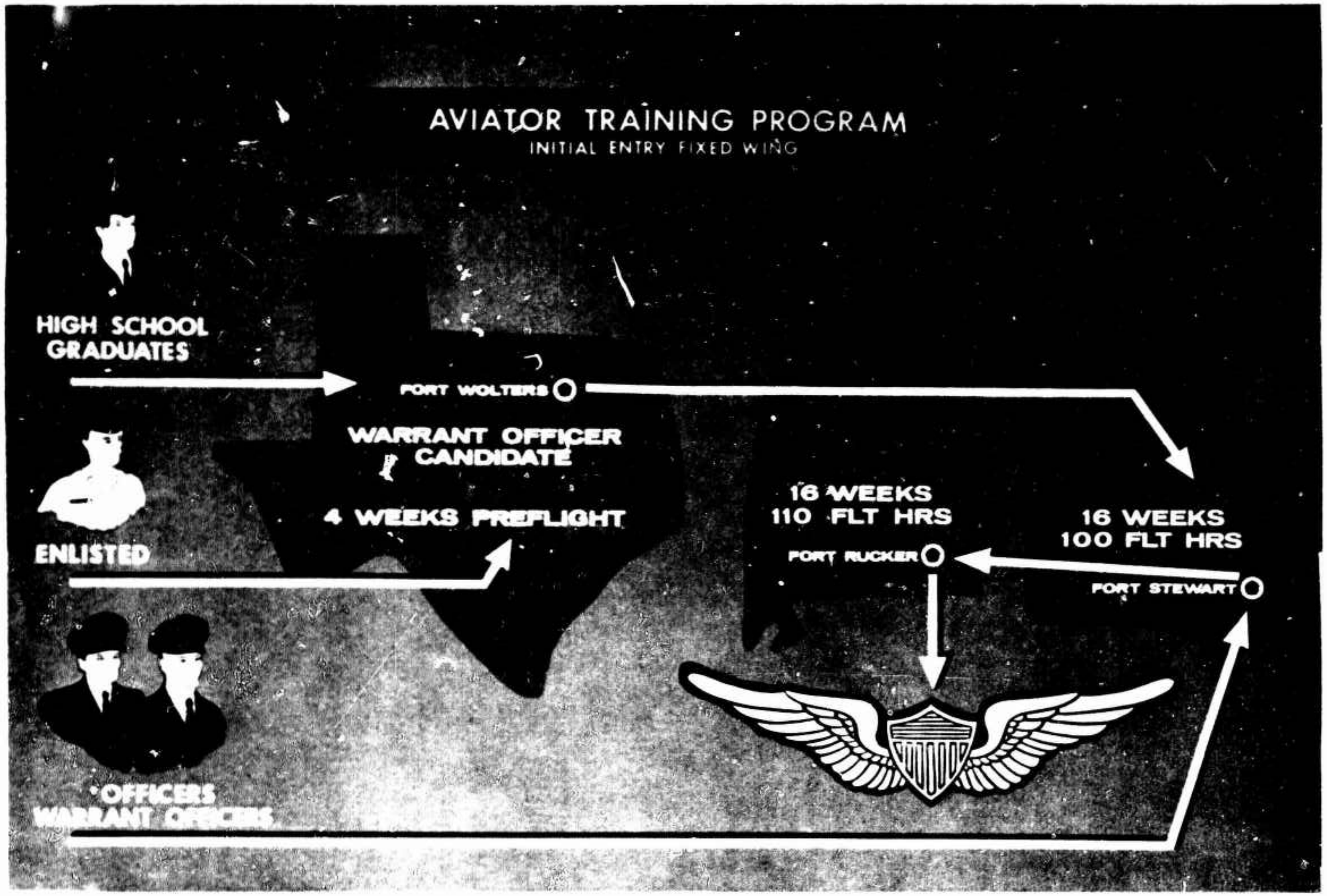

Figure 3. Initial Entry Fixed Wing Course

During Phase "C", the student flies the Beech Baron or T-42. This is an eight weeks phase which is given by a civilian contractor. During this phase, the student picks up his twin engine qualification and his instrument qualification. From here the student goes to Phase "D" and starts flying the O-1. The first four weeks of this phase is given by the Department of Fixed Wing.

During Phase "D", the last four weeks is tactics training geared toward a subsequent assignment in Vietnam. And here again, just like in the Rotary Wing Tactics Phase, all of the IP's are Vietnam veterans. For this training the students operate out of the tactical base, TAC 1. This base is also used by rotary wing students.

In summary, the Initial Entry Fixed Wing Course is also 32 weeks long, and the student receives 210 flying hours. Sixteen weeks of this training is given at Fort Stewart, and the last 16 weeks is given at Fort Rucker.

The newest qualification course is the U-21 qualification course. The U-21 is the newest aircraft in the Army's inventory. The course is conducted at Fort Rucker and consists of four weeks and 25 flying hours. The U-21 has an airspeed of 208 knots and will carry 10 troops. Input 16, Total 140.

In addition to the Initial Entry Fixed Wing Course, we also conduct other fixed wing training.

The third category of training is <u>Officer Specialty Courses</u>. One of these courses is the Flight Surgeon's Course. There are two variations of the Flight Surgeon's Course. One is a two week course for medical officers who have had training by the Navy or the Air Force. The other is a five week course which is for the medical officer just coming on active duty. The subject matter in both is essentially the same. The other specialty course is the Aviation Commanders' Vietnam Orientation Course. This is a two week course designed for commissioned aviators en route to Vietnam who anticipate a command or staff position. All the training in this course is geared toward an assignment in Vietnam. Input 15, Total 88.

The fourth category of training is conducted by the Department of Maintenance Training. This department is actually a school within a school. They handle by far the largest number of students. They train some 17,000 maintenance students a year. This training includes classroom training, but emphasis is placed on minimum time in the classroom and maximum time on practical work on the aircraft.

We can take a new student in 11 weeks and train him to be a mechanic/crewchief/door gunner on the UH-1. The first five weeks of training is

in what we call the basic MOS course. When the student finishes this five weeks, he is qualified to service the aircraft and to perform as a mechanic's helper. The second five weeks are spent on the UH-1. The last week is spent on environmental training.

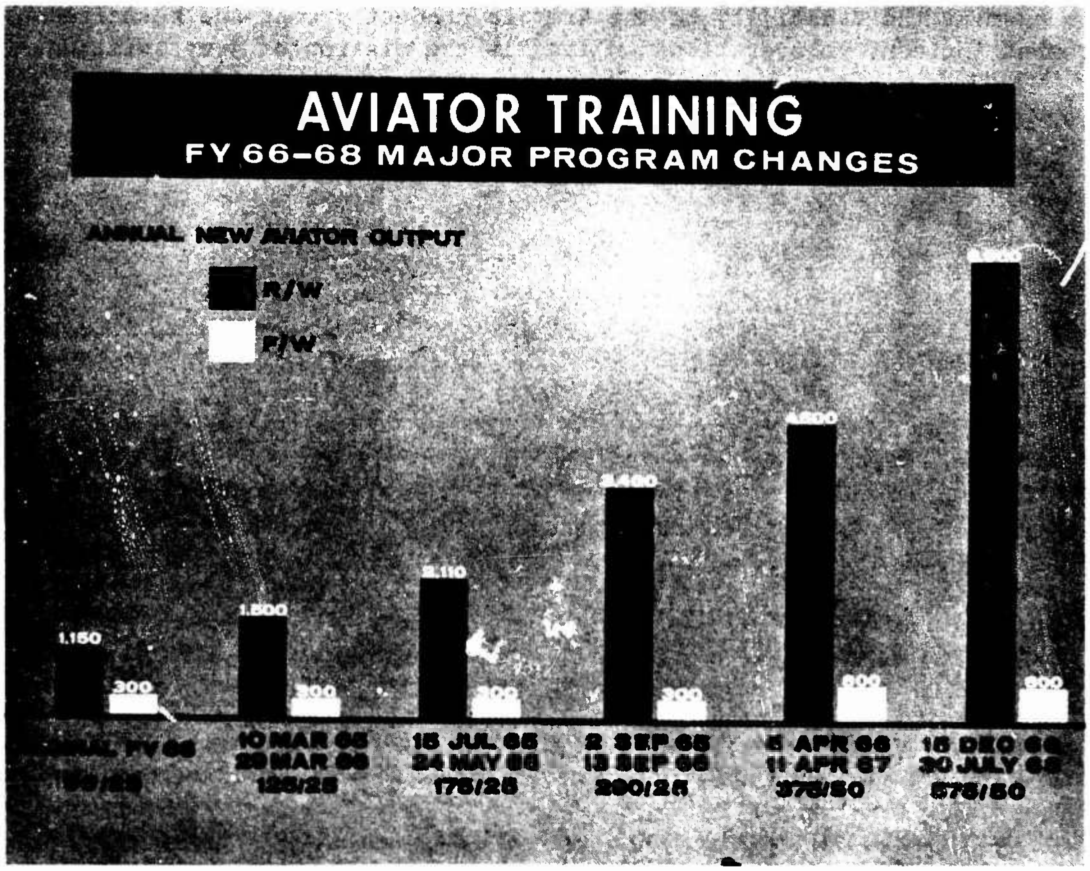

Figure 4

Figure 4 will give you an idea of the tremendous increase we have had in the aviation training program during the past two years. We began FY66 graduating 96 helicopter pilots and 25 fixed wing pilots a month. This would have given us 1,150 helicopter pilots and 300 fixed wing pilots a year. We are now graduating 375 helicopter pilots and 50 fixed wing pilots a month. We have just begun a program which will graduate 575 helicopter pilots and 50 fixed wing pilots a month. This will give us an annual output of 7,500 new aviators. This is more than the combined total trained by the Navy and the Air Force.

We also train foreign students here at the school, and we expect to graduate some 324 in FY68 as opposed to 94 in FY66 and 143 in FY67. The majority of the helicopter students will be from countries in Southeast Asia.

In summary, these organizations which we have discussed work together as a team.

To augment the capability of the Army to conduct prompt and sustained combat incident to operations on land is the mission of Army aviation.

DEPARTMENT OF PUBLICATIONS AND NONRESIDENT INSTRUCTION

Gentlemen, I am the Acting Director of the Department of Publications and Nonresident Instruction. I want you to know that I consider this conference to be the most important one that is held at this school. As a result, a lot of time has been spent in preparation of this presentation. This department, like everything here at the Aviation School, has to stay modern and up-to-date. My talk will cover some of the functions and facilities of the department. I am sure most of you understand what the NRI stands for, and I think you will understand about the publications when I have finished. I want to point out that during the course of this presentation you will receive a large number of handouts. I encourage you to take them back with you to your home station; however, if you don't want to keep something, feel free to leave it on the table. If you want us to deliver your handouts to your billets, just place them in the large envelope that you will receive, write your name and room number on it, and we will get it to your room. This morning I will cover the preparation of Department of the Army training literature; the Army Aviation Digest and its role in Army aviation training; the Aviation School Library and the services it provides; and finally, the status of nonresident extension training.

The Literature Division coordinates the preparation of official Department of the Army training literature for which the school has proponency. Current, up-to-date lists of these publications are being passed out. Additionally, for your information, we have added to the list the manuals which are the responsibility of the Combat Development Command Aviation Agency. Included with the list is a schedule of changes and additions to be made to this literature during the next year. Although the Department of P&NRI doesn't stock or issue any Department of the Army publications, we will be happy to receive any comment that you may have concerning any material they contain. In this regard, this is one way in which you can assist us. Annually, the Aviation School sends a letter to the field requesting that a review be made of all manuals and training literature for which the school is responsible and that comments be made on the content, coverage, adequacy, and for that matter, anything that will improve any of these documents. In other words, if you will tell the Aviation School what you want and need in aviation literature, it can be included in a future revision. You know that the revision of manuals and training literature is not always as dynamic a process as we would like it to be. A manual, often a year or two in preparation, may contain material that is obsolete by the time it gets into the hands of the troops. However, right now, the Aviation School's

publications are as current and up-to-date as the ever-expanding Army Aviation Program will permit. The girls are passing out a booklet, "Common Subjects and Reference Data for Army Aviation in the Field Army," which is prepared and distributed annually by this school. Copies of this publication are sent to all the Army schools, and a copy is given to every officer and warrant officer trained here. This manual helps to offset the obsolete material that sometimes exists in the Department of Army aviation training literature. You will find this to be a most up-to-date reference on Army aviation topics.

One unique medium available to Army aviation for dissemination of information is the AVIATION DIGEST. Although prepared here, it is an official Department of the Army publication and should not be thought of as the mouthpiece of the Aviation School. Approximately one-fourth of the contents of each issue is contributed by the Army Board for Aviation Accident Research, and the remainder is made up from contributions from aviation personnel worldwide. Since its inception some thirteen years ago, the DIGEST has developed into one of the finest information magazines in the service. Its purpose is to inform people throughout the Army of the latest techniques and developments in aviation safety, accident prevention, maintenance, training, research, aeromedical activities, and other related aviation matters. We find that it is a very responsive means of disseminating useful information in an informal manner. Although it is not directive in nature, we know that many worthwhile tips, ideas, and techniques have found their way to the field by way of its pages.

The DIGEST tries to publish timely articles which will present the latest information such as the latest development in flight suits and equipment to its readers. It has a worldwide circulation of over 60,000; this is 13,000 over last year this time. It is well worth the time you spend reading it. If you are not getting this magazine, the handout entitled "Looking for the Digest" explains how to get it. You will find this handout tucked inside the copy of the latest issue of the magazine which is being passed out now. It would be a great help to the aviator students at your school if someone would make sure that the DIGEST distribution you receive provides sufficient copies for their use.

You probably are aware that we are always looking for appropriate articles on Army aviation and related subjects, and I urge that you and your associates prepare and submit articles for publication. We welcome any article that you would care to submit. Writing for the DIGEST can be rewarding in several ways. First of all, the fact that you have prepared something that has been accepted for publication is a reward in itself. According to Army regulations, this accomplishment should be recorded in the author's official file. When appropriate,

the DIGEST staff sends the necessary details to the personnel officer concerned for every article published. In addition, the author of the prize-winning article in each monthly issue receives a handsome wall plaque and twenty-five dollars. Furthermore, he is then automatically in contention for a big annual cash award. The annual writing contest awards are now $250, $150, and $100 for 1st, 2nd, and 3rd prize respectively, along with another wall plaque.

Next, I want to mention the school's technical library. I'm sure you can tell this is not the Special Services type. The emphasis in the library is on material relating to the fields of military aviation, Army aviation, military science, recent military history, management, and international affairs. It has over 22,000 volumes and 14,000 cataloged technical reports on the shelves. This year should show an additional increase. Since this material is oriented toward aviation subjects, it should be of interest to you in terms of research material and background information. This is the largest collection of Army aviation material in the Army. If the library at your location doesn't have the reference material you need, ask them to check with the Aviation School Library. If it is available here, you can get it on an inter-library loan. The library has prepared a number of bibliographies on general subject areas which it is glad to supply on request. The library can now provide individual or small group study rooms as well as better research area for the staff. The library provides much assistance to the patrons in research; there are many instances when certain information has been researched and even supplied to personnel overseas.

The Extension Division of the department has been in existence less time than any other. Three years ago we took over administration of the extension instruction as well as preparation of the courses. Since that time we have averaged a 5,000 continuous student enrollment. The division now offers five extension courses consisting of 56 subcourses. In the near future we plan to offer a safety course patterned after the aviation safety orientation course now conducted by USABAAR, a senior NCO course similar to those now being offered at the other service schools but oriented towards aviation subjects. Within the next year or two, this school will be offering warrant officer career courses. It is planned that parts of these courses will be offered by correspondence. Along with this, the Extension Division supplies all of the master lesson plans requested from units in the field. Please note that the latest change contains a helicopter instrument flying course packet that was developed as a result of your comments last year and from requests from units in the field.

Last year, our slide rule handout was received with such interest, we have updated it and corrected the errors. This is the latest

version available. We also issue this slide rule to all students going through the school.

This has been a quick broad brush examination of how the Department of P&NRI can help you with your instructional duties. I welcome your interest in these functions as well as the other functions of the department that I did not cover. I will be happy to discuss our supporting role in greater detail with anyone who might be interested.

PRESENTATION BY PLANS BRANCH, DOI

Good Morning, gentlemen, I am LTC Rutkowski. I have the Plans Branch under the Director of Instruction of the United States Army Aviation School. It is a pleasure for me to have the opportunity to tell you about our future training plans. The areas of our current primary interest are the AH-56A Cheyenne, as shown in figure 1, and the OH-58A, the Army's latest LOH purchase. The traditional Indian name has not been selected as yet for the OH-58A. The Warrant Officer Career Courses are probably new to most of you as well as the Door Gunnery Course. We are very enthusiastic about the Cheyenne and looking forward to receiving it at the Aviation School. I want to give you some background information on the Cheyenne so that you will have an appreciation for the training problems involved.

The readily apparent differences, of course, are the wings and the pusher propeller. The other significant difference, not apparent in the figure, is the rigid rotor system. The employment of these systems which result in a compound helicopter are something new to Army aviation.

The absence of weapons systems gives the Cheyenne a rather naked appearance. It will be configured with various combinations of 40mm, 30mm, 7.62 minigun, rockets, and TOW missiles. A formidable arsenal.

The four blade tail rotor is for anti-torque purposes and the three blade propeller to your right is the pusher or thrusting propeller. The pusher propeller assists in giving the Cheyenne its rapid acceleration, deceleration and high air speed capability. It also makes it possible to keep the fuselage in a horizontal plane while at a hover and throughout all speed ranges during forward flight. Combining the lift from the wings and the thrust from the pusher propeller results in rotor disc unloading thereby allowing higher air speeds and reduced rotor blade stress.

There are various benefits realized through the use of the compound mode. Approximately 80 knots on up wing lift increases, and rotor disc lift decreases - thereby allowing for a much higher air speed. The complexity of the Cheyenne will be apparent to you by the system we are about to discuss.

A central computor provides the pilot with the necessary readout so that he can navigate without the use of ground radio aids or visual contact with the ground. The pilot can navigate by selecting the grid coordinates of his desired destination and may check point enroute.


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The computer will provide him with the readout to maintain the designated course. A back up system is available in the event the primary malfunctions or sustains battle damage. The training implication in qualifying the aviator to fully utilize the avionics equipment to the best advantage in either crew station is certainly evident.

The fire control system is computer controlled and assures a high probability of first round hits. A sight stablization system is coupled to the fire control system and assists in keeping the sights on target. With all of these systems on board, a division of responsibility for the operation of them must be established. The systems are controlled by the pilot and copilot/gunner. The pilot can, at any time, take control away from the copilot/gunner or vice versa.

A telescopic sight capability exists at the gunner station and provides him with a maximum of 12 power magnification. The copilot/gunner views this through his periscopic sight.

Aviator transition, that is, pilot and copilot/gunner training, is planned to start in August 1970. At this point in time, some unanswered questions exist in regards to Cheyenne training. Questions such as the number of aviators to be trained annually, the number of flight hours required to qualify the aviators, and unit training. All of these questions will be answered in the very near future.

The training that will be necessary to qualify aviators to perform as pilot and/or copilot/gunner will cover the following areas:

<u>Flight Transition Training</u>: This training will be from the pilot's station and the copilot's station. Flight training will involve transition to and from the compound flight mode, something new in Army aviation.

<u>Navigation System</u>: Operation of the computer control console, the doppler inertial navigation system, the bearing distance heading indicator (BDHI), and other standard systems, i.e., VOR, ILS, etc.

<u>Weapons System/Fire Control System</u>: This includes ranging and target fixing procedures, weapon selection and computer in/computer out operations.

<u>Instrument Flight</u>: This includes instrument approaches without ground navigational radio aids, using the self-contained instrument navigation systems.

<u>Swiveling Gunners Station</u>: Another first for Army aviators.

Optical Sight/Periscopic Sight: Allow for computer controlled firing which compensates for ballistics, linear motion and range variations.

We propose to conduct a great deal of this training by the use of very sophisticated simulators. A significant savings will be realized through the maximum utilization of simulation.

A Cheyenne combat operations simulator system has been proposed. This system has three subsystems: a tactical trainer, a copilot weapons system trainer, and a pilot weapons system trainer.

The pilot and copilot weapons systems trainer will provide procedures training in the weapons systems of the respective crew stations. The tactical trainer will provide more sophisticated training in the various aspects of attack helicopter employment to include: target acquisition, target engagement, fire team control and employment, escort procedures.

I think you will agree that this attack helicopter with its complex aircraft control, navigation, communication and weapons systems will require a very comprehensive and detailed training program.

The Bell Jet Ranger helicopter is not exactly the same as the civilian version. The major differences are: a longer blade, a longer tail boom, and a different transmission.

2200 aircraft will be delivered over a five year period with options to increase the quantity. Deployment of the OH-58A was initially planned for Europe only; however, now it may be deployed to Vietnam.

The Aviation School will be responsible for user/support maintenance and aviator transition training. The qualification of selected aviators to be unit instructor will start in August of 1969. Graduates of this course will return to their units as qualified instructor pilots and transition their unit aviators in the OH-58A.

We have discussed equipment, now let us see what we have planned for personnel.These courses provide our aviation warrant officers with courses during their careers that are correlative to the officers' program: (1) Aviation Warrant Officer Career Course - 22 weeks 4 days, and (2) Aviation Warrant Officer Advance Course - 27 weeks 4 days.

The purpose of the career course is to provide aviation warrant officers with a working knowledge of the role of Army aviation as it relates to the missions and functions of the Army; aviation unit staff functions procedures; and a general knowledge of combined arms operations for

responsible assignments.

Here are some of the highlights of the career course:

Aviation	219 Hours
Organization of Army Aviation Units	
Future Trends in Army Aviation	
Safety	
Maintenance	80 Hours
General Military	84 Hours
Unit Administration	
Effective Writing	
Military Justice	
Command & Staff	32 Hours
Communications	17 Hours
Combined Army	266 Hours
Tactical Doctrine	
Airmobile Operations	

The career course is scheduled to start in July of 1969 with a 200 student flow annually. A transition course, instrument examiners course or safety course will be available prior to or after the career course. The prerequisites for the career course are: He must be an aviation warrant officer on flight status and completed three years as a rated aviator. He must be a member of the active Army or of a reserve component. The obligated service for active Army aviation warrant officers is two years.

The purpose of the advance course is to provide aviation warrant officers with a working knowledge of the role of Army aviation, as it relates to the functions of the Army; aviation unit staff functions procedures; aviation safety and techniques of aircraft accident prevention/investigation; airfield operations; air traffic control; and a general knowledge of combined Army operations.

Here are some of the highlights of the advanced course:

Aviation	142 Hours
Flight Subjects	
Aviation Medicine	
Aviation Armament Systems	
Maintenance	86 Hours
General Military	61 Hours
Command & Staff	32 Hours
Communications	6 Hours

Combined Arms ________________________________ 160 Hours
Combined Arms Organization
Special Operations
Combat Service Support

The advanced course is scheduled to start in August of 1969 with a 120 student flow annually.

You probably recognize a similarity in the career course and the advanced course.

The students who will attend the advanced course when the program first starts up will not, of course, have completed the career course; therefore, we do have some overlap in POI. The similarity will exist for a period of approximately four years at which time the necessary changes will be made to differentiate the courses.

A transition course, instrument examiners course, or safety course will be available prior to or after the advance course.

The prerequisites of the advanced course are: He must be an aviation warrant officer, grade W-4 or selected for W-4 and be a member of the active Army or of a reserve component. It is not necessary to be on flight status. The obligated service for active Army aviation warrant officers if one year.

In order to provide our units in Vietnam with qualified door gunners, a course has been established that is in fact MOS producing. The qualified personnel will be identified by MOS 67A1F. The prequisites for the course are: He must be qualified as Aircraft Maintenance Crewman (67A10). He must be a volunteer and physically qualified for flying. He must have nine months or more of active duty service remaining after completion of course.

Our first class started on 8 July of this year.

Here are the highlights of the course:

Environmental Training ________________________ 32 Hours
Map Reading
First Aid
Crew Member Duties
Ammunition Safety

Gunnery Training ______________________________ 44 Hours
Assembly, Disassembly, M60
M23 Aerial Gunnery Day & Night

UH-1 Maintenance________________________________ 36 Hours

Inspections
Aircraft Systems
Airframe
Flight Controls

During his training, the potential door gunner will actually fly four hours and twenty minutes. The course length is three weeks, one and one-half days.

Gentlemen, that gives you a broad brush of what our major future plans are, plans that significantly contribute to our continuing effort to better support the ground commander.

PRESENTATION BY DEPARTMENT OF ROTARY WING TRAINING

Professional improvement is the order of the day in the Department of Rotary Wing Training where the training of initial entry student aviators is completed and the flight qualification of rated aviators is increased.

The Aviation School obtains the initial entry students from the Primary Helicopter Training School at Ft. Wolters, Texas. Three years ago the initial entry class consisted of 98 students per month. The present initial entry class has grown to 193 students every two weeks, with the necessary expansion of the school facilities. This rapid growth has placed a heavy demand on the assets of the school and the department.

After completion of his 16 weeks of primary helicopter training at Fort Wolters, Texas, the student pilot comes to Fort Rucker and the Department of Rotary Wing Training for his advanced helicopter training.

He initially starts his training at Shell AHP where he receives the first 4 weeks of an 8 week tactical instrument course. This instrument course is designed to qualify the aviator to fly a helicopter, under combat conditions, in adverse weather. He uses the TH-13T helicopter, and "off-the-shelf" instrument version of the OH-13 series helicopter produced by Bell for both basic and advanced instrument training. The TH-13T is fully instrumented with automatic direction finder (ADF), radio magnetic indicator (RMI), VOR receiver, ILS receiver with glideslope, marker beacon, flight instruments and radio communication equipment. The TH-13 with a turbo charged engine makes an excellent instrument trainer and is considerably cheaper to operate and easier to maintain than the UH-1. In this stage of training, the student learns to control the aircraft solely by reference to his instruments.

The student is equipped with a hood which restricts his vision to the instrument panel. He is taught to fly the helicopter straight and level, make turns, climbs and descents, and to execute instrument take-offs. Additionally, he is taught to execute all of these maneuvers under partial emergency panel which simulates a failure of his primary flight instruments. During this same period at Shell Field he is introduced to the link trainer and is prepared for advanced instrument training by receiving coordinated classroom and procedural trainer instruction on enroute and instrument approach procedures.

Shell Field has 30 procedural trainers. Although these trainers save a good deal of flight time by teaching procedures on the ground, they are fixed wing trainers of World War II vintage that have been converted to a helicopter configuration. They leave something to be desired in the field of flight control, however. In a year or two these trainers will be replaced with a true helicopter operational flight simulator. The SFTS (Synthetic Flight Trainer System) is expected to enable a great portion of the instrument course to be taught on the ground with an accompanying savings in flight time and costs. This will be discussed in detail later.

The student receives the first 25 of his 100 flight training hours here at Fort Rucker in the basic instrument division.

Upon completion of basic instrument training at Shell AHP the student moves on to the advanced instrument division at Hanchey AHP. The student continues to utilize synthetic flight training during the advanced instrument phase of training to include a final check ride in the link trainer that precedes his final check ride in the air. The student receives 20 hours of link training. The department has 60 trainers located at Hanchey and on main post that are used for the initial entry student and in the more advanced instrument qualification courses.

During the advanced instrument phase, the student is taught to navigate under simulated instrument conditions utilizing low frequency airways as shown in figure 1 ,and to add realism to the training the navigation aids have been given Vietnamese names which are frequently used in Vietnam. A standard ADF approach and ground controlled approaches (GCA) are included in the initial entry students training. The GCA's consist of 4 and 8 degree angles of approach to simulated minimums of 220' and ½ mile. The standard FAA approach angle for a GCA varies from 2 to 3 degrees for fixed wing as well as rotary wing aircraft. Until last year, no determination had ever been made of the steepest usable glide slope angle for helicopters. The Department of the Army directed that a joint project be conducted between the FAA and the Army to determine the data necessary for the formulation of helicopter precision approach procedures appropriate to the maximum angle to be flown. The Department of Rotary Wing Training was designated as the test agency, in conjunction with the FAA, to conduct and evaluate the approach angles for helciopters. The angles evaluated were 5, 8, 10 and 12 degrees. The 11 degree approach angle was found to be the maximum satisfactory angle of descent for the average trainee instrument pilot; however, steep approachs did present problems to the neophyte. Airspeeds were also varied throughout the test. Forty knots was found to be the optimum approach airspeed for executing the GCA approach and maintaining descent on the glidepath. At lower airspeeds, aircraft control was a problem; with higher airspeeds, when the aircraft got above the

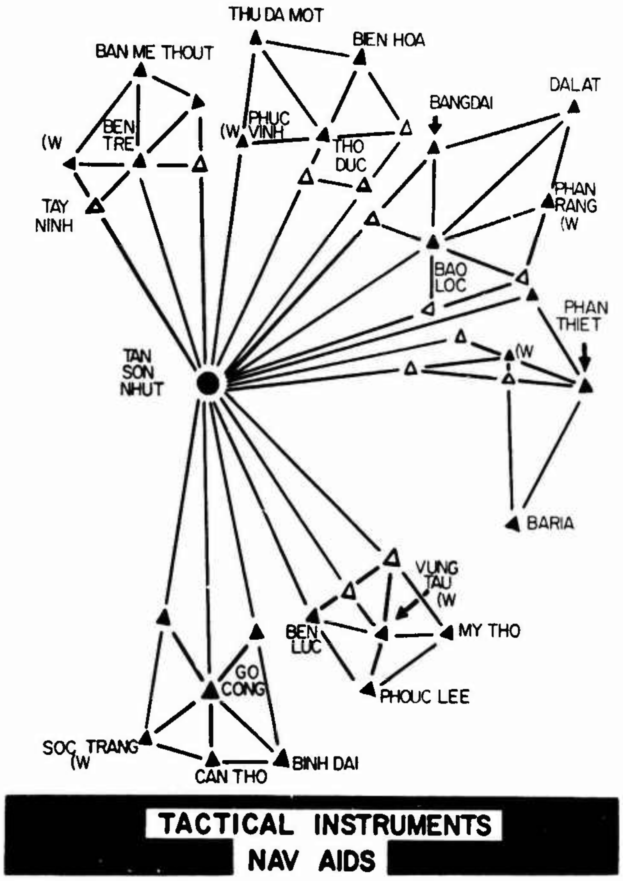


Figure 1

glidepath during the approach, difficulty was experienced due to the high sink rate required to return to the glidepath. Reserach is continuing to refine the techniques and to optimize the angle of approach during GCA operations for helicopters. When a student completes his 25 hours with the advanced instrument division, he is awarded a tactical instrument ticket which attests to his qulaification to fly instruments in a tactical environment. Although he has been trained on a simulated airway system he has not received the OMNI and ILS training to execute instrument flights on the FAA airways or the ICAO systems in the world. When he has completed instrument training, the UH-1 "Iroquois" is next in line for the student pilot; he will spend his last 50 hours at Fort Rucker in this operational aircraft which he will be flying after receiving his coveted wings. The first 25-hour phase of the UH-1 training to transition the neophyte into the Huey is given by the department's contact flight division operating out of Knox AHP. The student learns to fly the A, B, D and H model UH-1's during this phase. Four stagefields and their associated training areas are used in conducting the "Huey" transition training. Hunt Stagefield is typical. Here the student practices normal, running autorotations, etc. Each field is required to have crash rescue, fire fighting equipment and operational two-way radios for flight-following service when the aircraft are operating in the area. All aircraft are flight followed and controlled to increase stagefield usage, efficiency and

to enhance safety. The flight following procedures are similar to those used throughout Vietnam.

After soloing, the student is required to fly 3 hours in a "Huey" with an internal load. This is a "variable load" which allows a selection of weight varying from 720 pounds to 2100 pounds. Flying with a loaded helicopter during training closely simulates the high gross weight conditions that the student will constantly encounter while flying in Vietnam.

Confined area operations test the student's ability to execute an approach to and depart from an area which is surrounded on all sides by natural or man-made barriers. The student's ability to make sound and timely decisions with regard to safety and, most of all, aircraft limitations must be developed. Many of the confined areas used in the training cycle are located off the military reservation. These are leased from local civilians. Presently there are approximately 100 confined areas on post and 221 on civilian property.

Ridgeline and pinnacle operations are also conducted in this phase. The student is required to execute approaches to and departures from areas that simulate operations in mountainous terrain. Due to the lack of mountainous terrain in southern Alabama, only the techniques used in mountain flying can be taught to develop an acute sense of judgement and knowledge of these operations. The effects of turbulence, updrafts, downdrafts and gusty wind conditions prevalent in such operations are discussed but cannot be demonstrated. The student conducts both confined area and pinnacle operations with the aircraft at max gross weights so he is made aware of the difference in the feel of the aircraft and the power available when operating under these conditions. At the end of his three months training with the Rotary Wing Department, the initial entry student has completed 75 hours of instruction in instrument and VFR operations; he is qualified to fly the "Huey" under visual and limited instrument conditions. All of the flying techniques and newly acquired skills the student pilot has learned with the department are put to the test when the Department of Tactics takes over for his final 25 hours of training. After having completed 110 hours at Fort Wolters and another 100 hours here at Fort Rucker or at Fort Stewart for a total of 210 hours of flight training in 32 weeks, the enlisted men who become newly appointed Warrant Officers and the Officer students receive their diplomas and the most important item "The Coveted Silver Wings of an Army Aviator."

The department also conducts advanced transition training and instrument training for personnel who have been rated for some time and require advanced qualifications.

Instructor pilot and pilot transition training is conducted in 8 different aircraft as shown in figure 2.

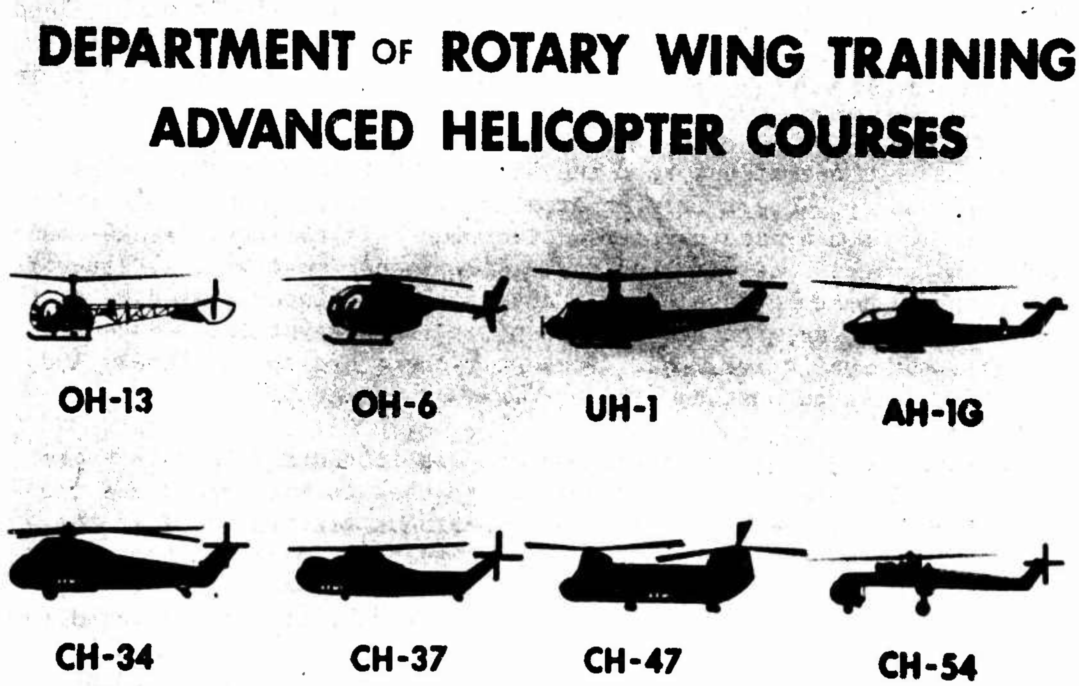


Figure 2

The Helicopter Instrument Flight Course is designed to qualify the contact only rated Rotary Wing Aviator in instrument flight. Through the use of programmed learning, this course has been reduced from a 75 hour, 16 week course to 54 hours and 8 weeks. The length of the course is based on aviator proficiency; it is conducted in the "Huey" by the advanced instrument division. The Helicopter Instrument Flight Examiners Course is 6 weeks in duration; it entails 48 hours of the most arduous flight instruction that the department gives. This course provides the instrument examiners who are found throughout the world; their primary functions are supervisor of unit instrument training and administration of annual check rides to renew tickets for instrument rated aviators.

THE UH-1 Instructor Pilots Course is designed to train army aviators as "Huey" transition and gunnery instruction pilots for army aviation elements and units throughout the world.

The CH-47 Pilot Transition Course is providing replacement aviators for the Chinook units in Vietnam. The Chinook is the tandem-rotored medium helicopter being used in Vietnam as a cargo and troop carrier.

The CH-45, "Flying Crane" Pilot Transition Course is also providing replacement pilots to the crane units in Vietnam; the Ch-54 is the largest helicopter in the inventory today. The CH-37 Transition Course is designed to qualify rated rotary wing aviators in medium helicopters based on requirements in Korea and Europe. A qualification course is conducted to transition the fixed wing rated only army aviator into rotary wing aircraft. Students in this course receive 25 hours of initial training in the OH-13 "Sioux" with further training in the UH-1 series helicopter. UH-1 training includes VFR transition; three weeks of instrument flight instruction, and 12 hours of tactical training. All in all, the student receives 77 hours of flight training in 12 weeks; upon completion, he is qualified, without further training, for a rotary wing assignment in Vietnam.

The first class in the LOH, Light Observation Helicopter graduated on 16 December 1966. The aviators who complete this course are both contact transition and gunnery instructor pilots capable of conducting transition and gunnery training in tactical units as they receive their LOH'S.

The AH-1G "Huey Cobra" Course, which is conducted at Hunter, consists of 18:45 of flight instruction in a 4 week 2½ day period.

The Military Assistance Program is primarily concerned with training pilots for our Southeast Asian Allies. After completing training at Fort Wolters, students in this course normally receive their flight training in the CH-34 "Choctaw", which is the helicopter most of their armed forces utilize. At present, there are 6 students per class with 4 classes in residence. They receive 97 flight hours in 16 weeks here at Fort Rucker. Students from certain allied countries are undergoing training in the UH-1 with our initial entry students.

Air traffic control for the Fort Rucker area is very complex. The department has approximately 390 aircraft airborne each flight period. In view of the total number of aircraft operating within the 35 nm radius of Fort Rucker and the overlapping of usable airspace that is necessary to accomplish the required training, it is mandatory that training airspace be apportioned for each department. The Fort Rucker airspace is divided laterally and vertically to accomplish our tremendous, complex training mission.

Within this department the airspace is further divided to segregate the various aircraft performing different training missions; i.e. contact, basic instruments, and advanced instrument training.

"Huey" transition for the initial entry student and contact portions of the other courses are assigned the area directly adjacent to the base heliports of Hanchey, Knox, Lowe and Shell; this contact training area lies generally northwest through southeast of the Fort Rucker Reservation. Within this assigned area, ths airspace is further divided so that aircraft using a specific stagefield have an immediately adjacent area to conduct confined area, ridgeline and pinnacle operations without conflicting with other training aircraft. Each associated training area contains 20 confined area sites and 2 ridgelines or pinnacles.

The upper airspace in the area northwest through southwest of Shell AHP is used to conduct the basic instrument training for the initial entry student. This airspace is further subdivided into small areas that are assigned to individual aircraft for training.

The advanced instrument stage of training for the initial entry student is conducted in the area northeast through southeast of Fort Rucker, outside and above the contact area. A system of airways was devised, to insure complete utilization of all available NAV Aids the "Pie Slice" concept was originated. The grey lines depict the airways, and intersections used in this training. The "Pie Slice" concept assigns a specific portion of airspace, which contains 2 nondirectional beacons and a GCA radar set to a specific flight to conduct its required training.

To present an overall view, the basic instrument area is in the western sector, the contact area in the center, and the advanced instrument area is in the east. The Helicopter Instrument and Helicopter Instrument Examiner Courses utilize the FAA airway structure in the local flying area which includes airway facilities at Montgomery, Columbus, Tallahassee, Pensacola and FAA Control Points in between.

The Department of Rotary Wing Training conducts many courses to qualify student aviators and rated aviators. The Department of Rotary Wing Training has increased its output 371% in the past 5 years. In FY 65 1899 students were trained and in FY 69 8985 students are programmed to graduate. In figure 3 the grey indicates the initial entry students trained at Fort Rucker, the grey and white hachure depicts the initial entry students trained at Fort Stewart; the black shows the advanced qualification courses taught at Fort Rucker. The Synthetic Flight Trainer System or the SFTS as it is commonly known around Ft. Rucker was mentioned earlier. The SFTS is essentially in intergration of modern simulation hardware and computer-automated training techniques.

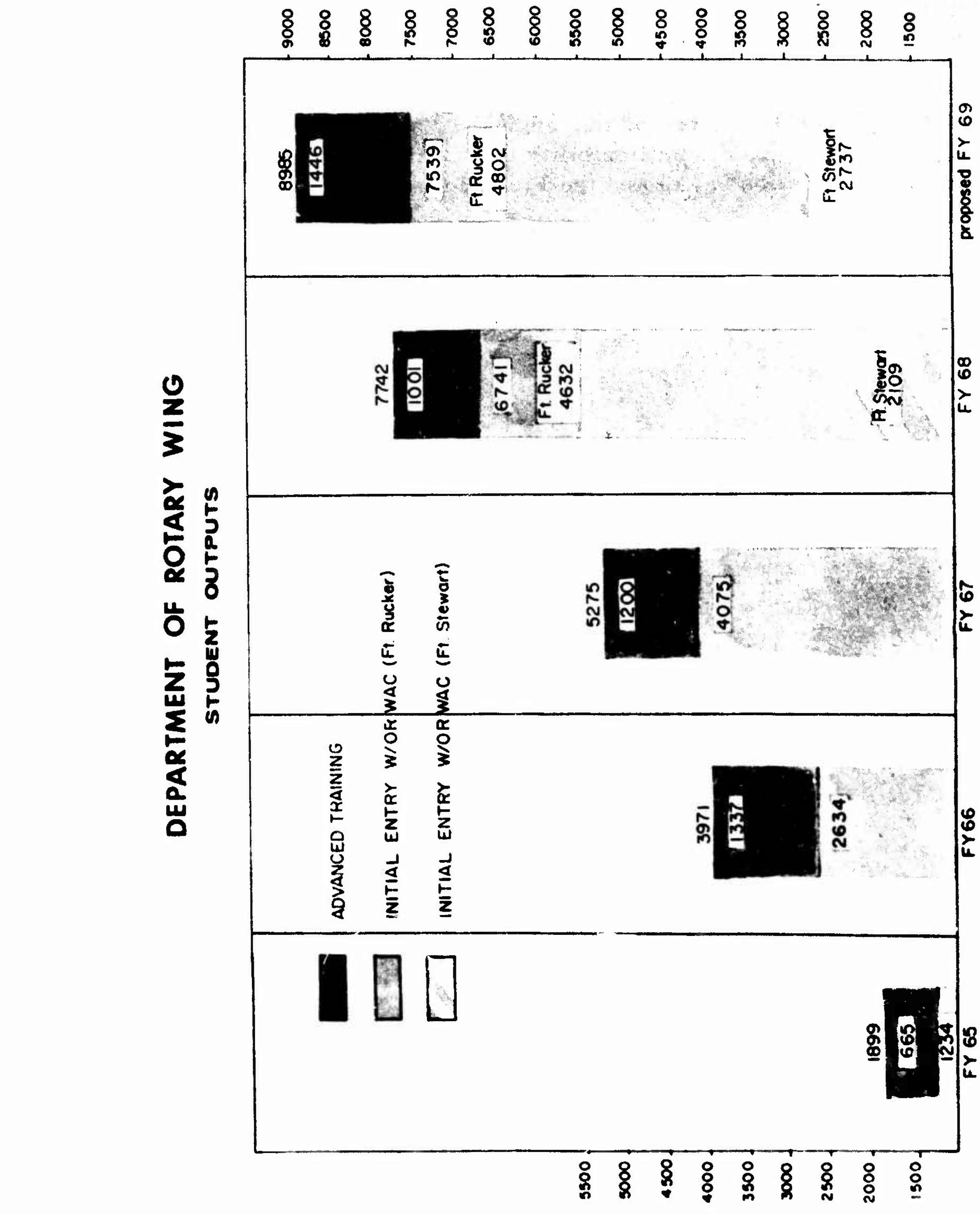

DEPARTMENT OF ROTARY WING
STUDENT OUTPUTS
ADVANCED TRAINING
INITIAL ENTRY W/OR WAC (Ft. Rucker)
INITIAL ENTRY W/OR WAC (Ft. Stewart)
1899
665
1234
FY 65
3971
1337
2634
FY66
5275
1200
4075
FY 67
7742
1001
6741
Ft. Rucker
4632
Ft. Stewart
2109
FY 68
8985
1446
7539
Ft Rucker
4802
Ft Stewart
2737
proposed FY 69
9000
8500
8000
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500

Figure 3

Figure 4 is a versatile up-to-date Synthetic Flight Training System, responding to the requirement for more efficient helicopter training. It features high fidelity representation; it is computerized for versatility, modular in construction; is automated for efficiency; and is adaptive to our training needs. The simulation design is based on the UH-1D, and the CH-47, two of our standard aircraft. The SFTS is designed to allow maximum flexibility in meeting the changing requirements of the Aviation School and the Field Units.

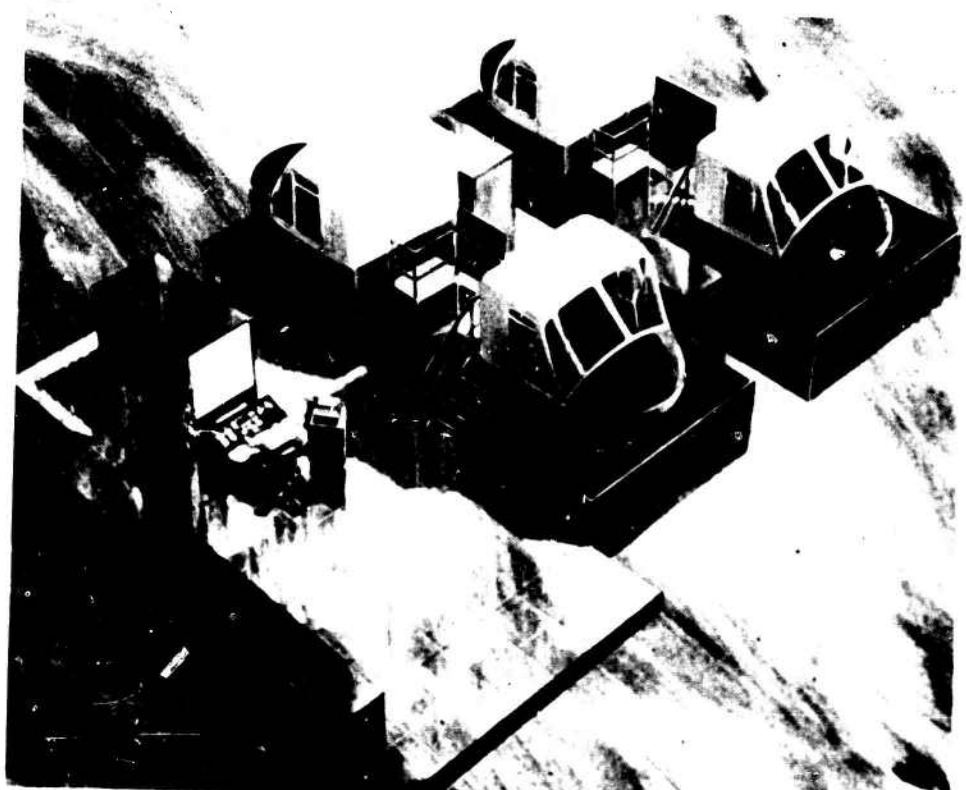


Figure 4

Provisions have been made for potential system growth, to include simulation of other present and future Army Aircraft and Aerial Weapons Systems such as the Cheyenne. A qualitative material requirement change has already been submitted to add the Cheyenne to the system.

Within this system, trainers are programmed for the Aviation School, Selected Installations and Service Schools throughout CONUS. The units will vary from 2 to 4 cockpits in size dependent on particular installation requirements. The system will: (1) improve the pilot instrument proficiency; (2) instrument training can be accomplished faster, better, safer and more economically; (3) provide less costly, better transition training, since use of the SFTS will allow the students to progress much faster during the contact transition phase and (4) it will provide improved, realistic emergency procedural training with minimum exposure to helicopter training accidents.

Eventually, the goal is to reduce instrument flight training hours FY 50 to 75% and those remaining hours may well become only a confidence phase where the student proves to himself, and to a check pilot that he can apply to the aircraft what he has learned in the trainer.

Theoretically, the time required to train and graduate a fully qualified pilot should be shortened. By teaching cockpit and emergency procedures and advanced instrument flight techniques in the SFTS, we can minimize initial learning time as well as a high level of aviator proficiency maintained following initial flight training.

Additional benefits, which are most important to the school and to a lesser degree to other installations, will be the release of training areas and airspace to other phases of aviator training; aircraft usage, maintenance effort and personnel requirements to support the aviator program should also be reduced.

In summary, the Department's primary aim is to qualify initial entry aviators: to improve pilot skills; and in the tradition of the Aviation School, to graduate the best helicopter pilots in the world.

PRESENTATION BY THE DEPARTMENT OF ADVANCED FIXED WING TRAINING

This briefing will cover the department's mission, courses conducted, organization, and brief look at the changes which have occurred in fixed wing training at the United States Army Aviation School during the past year. First, a number of Beechcraft modified King Air aircraft (UTE U-21) were purchased by the Department of the Army. This department was given the mission to train pilots and instructor pilots in the operation of this aircraft. The first class reported for pilot training in September 1967 and instructor pilot training began on 10 January of this year. The second change occurred in December 1967 when steps were initiated to establish an Air Traffic Control Division (Provisional), which was tasked to begin planning for the conduct of Air Traffic Control training by the Army. As you may know, this training is now conducted by the Air Force at Keesler AFB, but under the new concept this training will be conducted here at the USAAVNS. LTC Ferry will brief you on the proposed Air Traffic Control organization at the completion of my presentation. The third change to occur in the department concerns the Fixed Wing Instrument Qualification Course. This course was previously taught in the U-6, but in July of this year, the contractor began conducting this course in T-42 aircraft. And the last change concerns the Fixed Wing Qualification Course. Personnel will still receive their fixed wing qualification at Fort Stewart, but under a new program; they will then come to Fort Rucker where they will receive instrument and twin engine qualification. Again this phase will be conducted by a civilian contractor.

The primary mission of this department is to train fixed wing aviators to meet the requirements in Vietnam. Two other missions are related. One is to transition aviators in more complex aircraft. The other is to conduct MOS producing enlisted courses in aviation oriented fields. More on that later. Due to the expansion of aviation training at Fort Rucker, a portion of fixed wing training was moved to Fort Stewart, Georgia, with the first class reporting the 6th of August 1966. There are, therefore, actually two fixed wing departments: The Department of Primary Fixed Wing Training at Fort Stewart, Georgia, and the Department of Advanced Fixed Wing Training at Fort Rucker, Alabama. The Officer/Warrant Officer Fixed Wing Aviator Course and the Warrant Officer Candidate Fixed Wing Aviator Course are the basic qualification courses for fixed wing aviation and are comprised of the following phases:

Phase I - Consists of eight weeks and 50 hours of flight instruction conducted under contract by Ross Aviation at Fort Stewart, Georgia. Flight training in this phase is now conducted in the T-41 aircraft and includes primary flight maneuvers, emergency procedures, night flying, and basic day navigation.

Phase II - Consists of eight weeks and 50 hours of flight instruction conducted by military and Department of the Army civilian instructors, again at Fort Stewart. The T-41 aircraft is also used for this phase of training which includes advanced flight maneuvers, power approaches, shortfield techniques, night navigation and formation flying. A large part of "B" Phase training is conducted at a stagefield, learning to perform accurate landings over an artificial barrier and field and road strip techniques.

Upon completion of these 16 weeks of training at Ft Stewart, the students then report to Fort Rucker, where they receive the final 16 weeks of this course of instruction.

Phase III - Consists of eight weeks and 60 hours of flight instruction conducted under contract by Ross Aviation. Here the student aviator receives the instrument qualification portion of his training. This phase of training includes twin-engine qualification, basic attitude instrument flight, terminal and en route navigation training, and instrument qualification. The aircraft used for this course of instruction is the twin-engine T-42 Beech Baron. During the first four weeks of "C" Phase, the students receive 18 hours of instruction on instrument navigation procedures in an instrument simulator or synthetic trainer. This instruction supplements the training presented on the flight line and is a less expensive method of teaching the student instrument procedures. After completing the program of instruction on instrument flying, the student proceeds to the last phase of instruction in the initial entry course.

Phase IV - Consists of eight weeks and 55 hours of flight instruction. This last phase is again taught by military and Department of the Army civilians. During this first four weeks, the students receive 28 hours of training in the 0-1 aircraft conducted by this Department. The first two weeks of 0-1 training consist of transition in the 0-1. This training is conducted at Skelly Stagefield and includes upper air work, landings, take-offs, and precision power off approaches. Skelly Stagefield is also utilized for the third week of training which includes barrier approach training and introduction to strip operation. The final week of training consists of night flying, strip operations, and an end of stage check flight. Upon completion of this stage the students report to the Department of Tactics for the final four weeks and 27 hours of "D" Phase training. Here the students put all the things they have learned previously to practical application in a tactical environment under conditions similar to those they will encounter in Vietnam. Upon completion of this phase the student is graduated as an Army Aviator with a standard instrument rating and a multi-engine qualification. Some of the students will remain at Fort Rucker to undergo additional training in more complex aircraft, but the majority are bound for Vietnam.

In addition to the initial entry course, the Department of Advanced Fixed Wing Training also teaches advanced flight qualification and enlisted and officer specialty courses.

All of the following courses to be discussed are taught by the military and Department of the Army civilians:

The first of these advanced courses is the OV-1 Aviator Transition Course consisting of six weeks and 51 hours of flight instruction. The OV-1's mission is surveillance and target acquisition and, depending on the model, provides visual, photographic, infra-red and radar reconnaissance. This course qualifies an aviator only to fly the aircraft. Upon completion of this portion of the course the aviator will go to Fort Huachuca, where he will attend the Combat Surveillance and Target Acquisition School. There he is trained in the use of the surveillance equipment. A procedural trainer is used to teach the student cockpit and emergency procedures.

An OV-1 Instructor Pilot Qualification Course is also conducted consisting of 45 hours of flight instruction in six weeks. This is a stand by course and not conducted on a regular recurring basis.

The U-21 Aviator Transition Course consists of four weeks and 25 hours of flight instruction. The U-21 (fig. 1) is the latest addition to the Army inventory. It is a twin turbo-prop aircraft similar to the Beech King Air except that it is unpressurized and has a large cargo door.

The U-21 Standardization Instructor Pilot Qualification Course also conducted by the department consists of six weeks and 45 hours of flight instruction. A procedural trainer is utilized by the students as required in the U-21 courses.

The Instrument Flight Examiner Course is seven weeks in length and consists of 51 flight hours. The aviators attending this course are thoroughly trained in all aspects of instrument flying, regulations, and air traffic control procedures. It is a very difficult and demanding program of instruction. Graduates of this course receive an Instrument Examiner MOS of 1984 and are qualified to administer annual instrument flight examinations to instrument-rated aviators. The aircraft used for this training is the T-42 Beech Baron.

The Army Twin-Engine Qualification Course - This course consists of four weeks and 28 hours of flight instruction. The purpose of this course is to transition aviators in the U-8, the Army's standard command and control aircraft. Aviators attending this course receive 14 hours of flight instruction in the T-42 and 14 hours in the U-8.

Figure 1. U-21 (Ute).

The Fixed Wing Instrument Qualification Course - This course consists of eight weeks and 60 hours of flight instruction conducted under contract by Ross Aviation. Training is conducted in the T-42 aircraft. However, due to the introduction of the Fixed Wing Qualification Course instrument training in September, training may be resumed in U-6 aircraft because of shortage of T-42's.

The Flight Simulator Course qualifies an enlisted man as a flight simulator instructor with the ability to perform organizational maintenance at the unit level. The course is 11 weeks in length.

The Flight Operations Specialist Course provides enlisted personnel with a working knowledge of scheduling and coordinating aircraft flights and enables them to perform administrative and related functions pertaining to airfield operations. Graduates of this course are assigned to aviation units throughout the Army.

It should be noted that members of the Women's Army Corps are eligible to attend both of the enlisted courses taught by this Department.

To accomplish our mission, the organization of the Department of Advanced Fixed Wing Training corresponds to the courses taught. The organization includes the Office of the Director, an Administration Branch, an Operations Division, a Quality Control Branch, a Flight Training Division, a Standardization Division, a Contract Evaluation Division, ATC Division (Provisional), and an Academic & Synthetic Trainer Division. The A&ST Division has many diversified missions. In addition to providing instruction to fixed wing students and conducting the enlisted specialist courses, the division also provides extensive academic instruction to students in the Department of Rotary Wing Training. I should mention that the ATC Division is destined to become a Department at some time early in 1969 at which time it will splinter off from the Department of Advanced Fixed Wing Training.

The Department of Advanced Fixed Wing Training is authorized 241 personnel and has an average in-resident student load of 360 (230 officers and WOC's, and 130 enlisted). Training is conducted at seven auxiliary fields and 25 tactical strips, five of which are located to the east southeast to minimize conflict with Rotary Wing Training. All fixed wing aircraft of the Aviation School are based at Cairns Army Airfield and an average of 70 fixed wing aircraft are launched and recovered twice daily in support of fixed wing training.

This has been a quick look at fixed wing training at USAAVNS to include the mission, courses conducted, and organization. I will be followed by LTC Ferry, who will brief you on background and plans for the Air Traffic Controller Training. Upon conclusion of his briefing, we will jointly entertain any question you may have.

PRESENTATION BY DEPARTMENT OF ADVANCED FIXED WING TRAINING

AIR TRAFFIC CONTROL

Air Traffic Control - ATC. Air Traffic Control is now conducted for the Army by the Air Force. Army Air Traffic Control Training should be conducted by the Army rather than a sister service. Although extremely cooperative, the Air Force is not in a position to orient Air Traffic Control Training to Army requirements.

The Air Force training does not give Air Traffic Control men the chance to actually control traffic or even to actually talk to aircraft at any time during his training. There are other facts bearing on the situation:

Army Air Traffic Control men arriving in Vietnam are unable to assume their duties for anywhere from 3 weeks to 4 or 5 months and most first receive further training at schools established in Vietnam.

The Air Traffic Control MOS structure, 93B, does not provide for breakdown into highly specialized fields such as Ground Controlled Approach Operator, tower controller, en route specialist, or for any MOS where all of these skills are known by an enlisted man.

For nearly two years, Vietnam, including me when I was there, has been complaining about our Air Traffic Controllers being unable to assume duties. This very frank feedback through channels has forced us to review completely Air Traffic Control Training and the MOS structure.

At Department of the Army direction, several studies were developed on the training of Air Traffic Controllers. Last December a plan was approved and we were directed to start training 1 July 1969.

The approved plan provided for several items:

1. The 93B MOS Structure (air traffic controller) was revised providing 4 MOS's instead of one; Ground Controlled Approach Operator (GCA), Tower Operator, En route Controller, and an Air Traffic Control Chief. Instead of MOS 93B, there will be MOS's 93H, J, K, and L.

2. The Air Traffic Control School will start 1 July 1969 with 36 enlisted students entering a 15-week course each week. The plan also provides for a 6-week, non MOS, officers and warrant officers course, so that those people would know what they were doing when assigned to Air Traffic Control duties. In the past it was luck if officers and warrant officers had an Air Traffic Control background when given Air Traffic Control assignments. Twelve officers will enter

training each 4 weeks. The total in-resident load after we are operating should be about 600 students. Annual student load will be 1800 students.

The 15 weeks of training the enlisted men will receive looks something like this:

Basically, everyone will receive 8 weeks of common training which leads to an FAA Basic Controller Certification. Then the students branch out into their specialty.

Tower operators get an orientation in Ground Controlled Approach, then specialized tower training.

Ground Controlled Approach operators get some knowledge of tower work and then specialized training.

En route controllers get a bit of Tower and Ground Controlled Approach and then their en route specialization.

That first 8 weeks of common training promises to be a problem, since we are training men to pass an FAA test, not an Army test. If a man does not pass this certification test, he washes out and does not go to advanced training.

With that in mind, we are going to run that 8 weeks of training five times during the next year starting this month and we will call this instruction the Air Traffic Control Familiarization Course. We are taking 12 students out of the pipeline each 8 weeks and putting them in our classroom here on post. Their first 6 weeks of training will be devoted to passing the FAA Basic Certification Test, then they will receive 2 weeks of Army subjects. At that time, the students will be picked up by Airfield Operations here at Rucker for 8 weeks of on-the-job training. At the end of that period, they may be awarded a 93 MOS.

Training now conducted by the Air Force at Keesler Air Force Base is conducted along with Air Force Controller Training. Our students, though, compose well over 50% of the Air Traffic Control training load. Their classroom instruction is good. They give good laboratory training on Air Traffic Control equipment, but their radar simulation devices are old, out of date, and far behind the state of the art. They are unable to give live Air Traffic Control training with actual aircraft.

Here is what students will receive at Fort Rucker:

1. Classroom instruction using the best techniques and training aids we can develop.

2. Army instruction oriented to Army needs.

3. Improved laboratory training on simulation equipment so realistic the student will be able to move from radar simulation to the actual equipment and to live traffic and never realize the difference. This equipment will be better than anything now in use anywhere for Air Traffic Control Training.

4. Live training for Ground Controlled Approach Operators at six Ground Controlled Approach sites around Fort Rucker, each site capable of handling 4-6 students at a time. After graduation we expect these people to be able to assume their duties immediately upon arriving at their first station.

5. Live training for Tower Operators at 14 sites around Fort Rucker, each site handling 4-6 students. The result - when you order a Ground Controlled Approach Operator or Tower controller to a vacancy in your unit, you will get a Ground Controlled Approach Operator or a Tower Operator and one that is ready to go to work right then.

In order to accomplish the Air Traffic Control Training that starts next July, there will be an organization like this - An Air Traffic Control Department with two main operating divisions:

The Basic Division which will teach that first 8 weeks we spoke of earlier and

The Advanced Division which will handle Ground Controlled Approach, Tower and En route. There is also the Skill Development Training which I will cover in a moment.

Initially, training will be conducted in a block of converted barracks in the Tank Hill Area of Fort Rucker. In this block will be classrooms, laboratories and instructor and administrative offices.

The adjoining block will be billeting, mess, and administrative areas for the students.

The Engineer forms for construction of a 4.5 million dollar permanent laboratory-classroom Air Traffic Control Building have gone forward and we should see such a structure in 3-4 years.

A brief word that Increased Skill Level Training or Skill Development Training. Starting next May, we will take selected Army graduates of the Keesler Air Traffic Control School and give them 15 weeks of training at Fort Rucker. They will get 4 weeks of leadership training, 6 weeks of academic and laboratory training, and 5 weeks of on-the-job

training. At that time, they will be considered qualified for another stripe and will be ready for the field.

TO SUM IT UP

On 1 July 1969 the Army will open its own training facility for Air Traffic Controllers at Fort Rucker. By emphasizing Army requirements during training, by securing greatly improved training and simulation gear, and by providing live aircraft training for Radar and Tower Controllers, the Army is going to have better training than anyone else. Our people will be fully trained and ready to work when they leave Fort Rucker.

QUESTIONS

THE ROLE OF ARMY AVIATION

PRESENTED BY DEPARTMENT OF TACTICS

Today, the Army Aviation School will give you an insight into one of the United States Army's most significant contributions to combat effectiveness, Army aviation. Army aviation is not a separate branch of the Army, such as artillery, armor, or infantry. Rather, it is employed throughout the Army by the various branches in a wide variety of missions that assist the overall effort of gaining battlefield superiority. Army aviation assits the commander at all levels of command to accomplish his mission.

The ever-increasing role of Army aviation has been brought about by the dictates of the nuclear age and the employment of mobile forces both large and small, in counterinsurgency and stability operations. To accomplish his mission, the commander must have at his disposal a means of rapid mobility for himself, his staff, his troops, his supplies, and equipment. This means will be provided, on many occasions, by Army aviation. Today's presentation will encompass the history, development, growth, role, and missions of Army aviation.

Before proceeding further, I want to make clear the relationship between Army aviation and the support which is furnished by the Air Force. The use of Army aviation is simply the integration of modern improved means to enable the Army to perform its basic combat missions more effectively. It complements, rather than duplicates, the tactical air support mission performed by the Air Force. The Army will continue to look to the Air Force for the performance of the missions of air supremacy, air transport, and close air support to assist us in land warfare operations. In fact, our search for improved mobility will place increased demands on the Air Force in each of these missions.

The United States Army has the mission of conducting prompt and sustained operations incident to land warfare. Army aviation assists these operations by providing continuous aviation support to the Army's five major functions of ground combat. (Fig. 1). These five functions of ground combat are: (1) Command, control, and communications; (2) Intelligence; (3) Mobility; (4) Firepower; and (5) Service support.

Only one mission, that of aerial observation for the field artillery, was assigned to Army aviation when it was authorized on the sixth of June 1942. This authorization was a result of the War Department recognizing a need for organic light observation aircraft to be used for adjusting artillery fire.

Figure 1

The use of aerial vehicles in support of observation missions did not originate in World War II. Union and Confederate forces used balloons for observing troop movements during the Civil War. The technique of balloon surveillance was continued in an expanded fashion during World War I, coming to an end only when attacks by armed, fighter aircraft terminated its usefulness. The introduction of the airplane provided a new degree of flexibility and mobility to aerial observation. However, since aerial warfare was so new and exciting - and headline-grabbing - the ordinary mission of observation took a back seat to such glamorous new occupations at "Dogfights".

Initially, during World War II, the value of Army aviation was not realized by some of the ground commanders. Some commanders did not want to be bothered with the light planes or pilots. In Africa, occasionally, an entire artillery unit would move at night, leaving its air section somewhere back in the desert. Eventually commanders began

to see the value of the light observation airplane, and during the Italian Campaign, L-4's and L-5's directed artillery fire, carried commanders from point to point, dropped rations to isolated friendly troops, were used on Naval gunfire missions, and generally observed enemy actions. As the war progressed in Europe, the "Cubs" continued their missions with greater effectiveness. L-4's frequently caused enemy artillery to cease firing just by flying in the vicinity of the gun position.

They resupplied troops isolated by weather or the enemy and, on numerous occasions, were credited with saving entire companies. In the Pacific, the "Cubs" assisted Infantry units. In addition to directing artillery fire, missions included leading patrols to designated spots in the jungle, relaying positions of friendly and enemy units in the thick underbrush, and providing transportation between command posts when heavy rainfall brought ground transportation to a standstill.

During the Korean War, Army aviation did all it had done during World War II, only more frequently and more effectively. Newer aircraft, including helicopters appeared and broadened the use of Army aviation. Army aviators dropped flares to illuminate the battlefield, ran a small-scale courier service, and evacuated thousands of wounded combat troops. In this latter mission, Army aviation proved its initial requirement for the helicopter by evacuating over 17,000 wounded troops. These prompt evacuations, performed with light, H-13 and H-23 helicopters, resulted in a significant reduction in the mortality rate.

Today, Army aviation is authorized in eight branches - Infantry, Armor, Engineers, Military Intelligence, Transportation, Medical Service, Signal, and Artillery, as stated in Figure 2. The new Air Defense Artillery Branch which will become effective December 1968, will also be authorized Army aviation. The employment of Army aviation is characterized by immediate, flexible, and responsibe support to the commander, with the solo objective of assisting in the accomplishment of the assigned mission. The support objectives are accomplished by providing aerial means for the exercise of command, control and communications; collection of combat intelligence; mobility of troops and equipment; delivery of firepower; and service support.

The exercise of command, control, and communications is greatly assisted by the use of aircraft. Ground obstacles and dictances present less of a problem. Some of the specific tasks that Army aviation performs in support of command control and communications include: providing aircraft for command visits, courier and liaison missions, assisting in traffic and column control, acting as a radio relay, and as an aerial command post. Using organic aviation, today's Army commander is capable of conducting more command visits in less time. Commanders and staff officers at every level are able to be on time in those places which


INFANTRY
ARTILLERY
ARMOR
SIGNAL
ENGINEERS
MEDICAL SERVICE
MILITARY INTELLIGENCE
TRANSPORTATION

Figure 2

require their decisions and observations. In addition, aircraft radios afford the commander rapid, clear communications with the units of his command. Messages can be delivered and picked up when radio communication is not possible or when radio silence is in effect. Control is extremely important in the movement of vehicle columns. A commander or controller located in an aircraft can provide information to the ground units on the move. The location of other units, dispersal areas, and obstacles along the route can be spotted from the aircraft. In addition, armed helicopters can provide security against enemy action encountered by the column. The control of traffic is expedited through the use of aircraft. By observing traffic flow, Military Police personnel can prevent bottlenecks, reroute traffic, and can also station traffic policemene at critical points; helicopters are especially useful in the operation of straggler control posts. Radio relay is used to increase the range of the ground forces' communications. Two radio stations, unable to communicate with each other, are often linked together by using Army aircraft as a relay station. A utility helicopter is especially suitable for use as an aerial command post. It provides a highly mobile means for the commander and his staff to control operations and communicate with the elements of the command.

Army aviation is an important intelligence-gathering means, and provides the commander with immediate and up-to-date information about the enemy and the area of operations. Intelligence missions include such tasks as aerial observation of the terrain and enemy, aerial survey, battlefield surveillance, and target acquisition. Aerial observation, once Army aviation's only function, is still one of the most important uses of aviation in the Army. Aviators flying all types of aircraft on any mission within the battle area are the aerial "eyes" of the Army. They become a valuable source of intelligence when information about the enemy or terrain is reported to the various intelligence agencies.

The use of aviation not only expedites radiological surveys, but at times is the only means available to accomplish the task within a given area; that is, to provide reliable readings for areas with too high a level of contamination. A ground party could not be exposed to these high doses of radiation because of the exposure time involved. The aviator and observer, flying above the terrain, are receiving a lower dose rate and remain in the radiation area for a shorter period of time.

Topographic surveys are accomplished rapidly when aircraft are used to transport survey parties and equipment. Some survey equipment may be operated in the aircraft and provide direct reading information. Army aviation is, at present, actively participating in geodetic surveys in Alaska, Antarctic, North Africa, The Middle East, and Central and South America.

Aviation offers a responsive, economical, and reliable means to keep an area, or the enemy within a given area, under an effective watch. The introduction of airborne surveillance devices such as side-looking airborne radar, infrared devices, and improved aerial camera systems, make Army aviation a welcome addition to the commander's intelligence collection effort.

The capability of Army aviation to rapidly detect an enemy concentration, locate and identify such dispositions, and then direct fires against the target, makes this a very vital contribution by organic aviation to the success of the combat mission.

Since all Army aircraft are designed to provide airmobility, certainly one of the most important functions of Army aviation is to support the maneuvering of troops and combat equipment.

Airmobility in the battle area provides the ground commander with a means of rapidly massing and developing his troops. It permits him to disperse rapidly and avoid presenting a lucrative target for enemy mass destruction weapons. In addition to this ability to support rapid massing and dispersion of troops, Army aviation provides the commander with a choice of action independent of ground obstacles in the area. Some Army aviation units (such as the Airmobile Company) are designed specifically for the important mission of airlifting troops and equipment about the battle area; the timely employment of airmobile forces in a critical area could turn the tide of battle from defeat to victory. Another area of maneuver support is the air-movement of artillery, missiles, mortars, and other fire support weapons. By using Army helicopters, these weapons are delivered rapidly to firing positions. They are out of action for a minimum amount of time, and the commander need not worry about taking his unit over congested routes.

Army aviation also supports ground forces by screening the flanks of the maneuvering element, thereby preventing surprise actions by the enemy

Thus, Army aviation, while providing organic airmobility to the Army, affords the ground commander an important means to maneuver his forces, and achieve victory on the battlefield. The most dramatic example of the use of Army aviation to support the scheme of maneuver are the current operations in Vietnam.

Firepower is supported by Army aviation in several ways. The directing of artillery and mortar fires from aircraft has continued to be an important function through the years. Aerial fire support from helicopter-mounted weapons has only recently emerged as an important capability. It progressed from scattered incidents of aviators dropping

grenades in World War II and Korea, to the successful employment of armament systems mounted on helicopters in Vietnam

These armament systems include machineguns, rockets, a combination of both machineguns and rockets, guided missiles, and grenade launchers. The armed helicopter's ability to maneuver and accompany the ground forces provides the commander with an additional firepower capability. This organic aerial fire support extends the ground commander's means to deliver selective, responsive, accurate, and discriminating fires. Experience in Vietnam has proven that the Army must have an organic aerial fire support capability to fill the gap between conventional ground weapons and close air support. With its inherent mobility and speed, the modern Army can maneuver beyond the range of ground weapons where quick response to an aerial fire support request is vital to the success of the mission. Mobile aerial-mounted weapons are used by the ground commander in the same manner as his other organic combat resources, such as tanks, vehicles, and artillery; their targets, consequently, are the enemy machinegun nests, bunkers, tanks, personnel, and anything else that hinders the ground solider in seizing his immediate attack objective.

In addition, aerial fire support can be provided in marginal weather when high-performance aircraft cannot reach the target, or cannot attack the target using steep dive angles from high altitudes.

Within the Army Combat zone, Army aviation provides service support in several ways - some of these are: the resupply of high priority items (including nuclear components), aeromedical evaucation, assisting in construction projects, and the evacuation of downed aircraft.

The airlift of selected supplies and equipment, such as missiles and nuclear components, provides a rapid, responsive means of resupply. Not only are the supplies delivered rapidly to the using units, this method also eliminates the need for extensive security measures, tying up road nets, and it reduces the period of vulnerability to enemy attack. Army aviation assists in the logistics function by rapid "retail" delivery of critical supplies to units within the Army combat zone. Army aviation assault support units (using CH-47 (Chinooks)), as referred to in Figure 3, normally will be used to deliver these critical supplies. In many areas of the world such as Vietnam, aviation provides the only available means of effective supply support of combat units.

Many lives can be saved on the battlefield when wounded personnel can receive needed medical attention immediately after being wounded. Army Aeromedical evacuation provides the means for the expeditious movement of wounded from point of injury to the proper treatment station, as pictured in Figure 4. Air ambulance companies and detachments using

Figure 3

the UH-1 (Iroquois) have the primary mission of aeromedical evacuation. It should be pointed out that virtually all aircraft within the Army have the secondary or additional mission of aeromedical evacuation.

Army aircraft may be used on special logistic missions such as construction projects. Helicopters are especially useful in the construction of bridges, laying pipelines, antenna and pole-line errection, and in inspecting pipelines and lines of communications.

A recent capability of Army aviation is the evacuation of downed aircraft. The recovery of damaged aircraft in Vietnam has resulted in returning many to service that previously would have been lost. The CH-47 helicopter is credited with retrieving over 4,000 aircraft in Vietnam. This results in a savings of over one billion dollars.

Figure 4

Although helicopters have been used in combat prior to 1960, Vietnam provided the first wholesale use of the helicopter on the battlefield. Prior to Vietnam, the helicopter as a battlefield vehicle had been reguarded by many critics as being too vulnerable to small arms fire. It was quickly learned that this was not the case, and that by proper training in tactical flying, losses as a result of ground fire could be kept well below an acceptable rate. For example, recent statistics show that a helicopter sent out on a sortie takes only one chance in 550 of taking a hit, one chance in 6,500 of being downed, and only one change in 23,000 of becoming a combat loss.

The Department of Army has established definite guidelines and requirements for the assignment of aircraft and aviation units. Generally, those ground units requiring immediate and continuous aviation support in their daily operations have aircraft organic to the unit. Army aviation units are found at divisions, corps, and Army levels. Although currently there are 18 different types of aircraft in the Army's inventory,

present programs are underway to reduce this number to 9. Figure 5 shows this action will provide a sizeable reduction in those costs involving maintenance, training and parts.

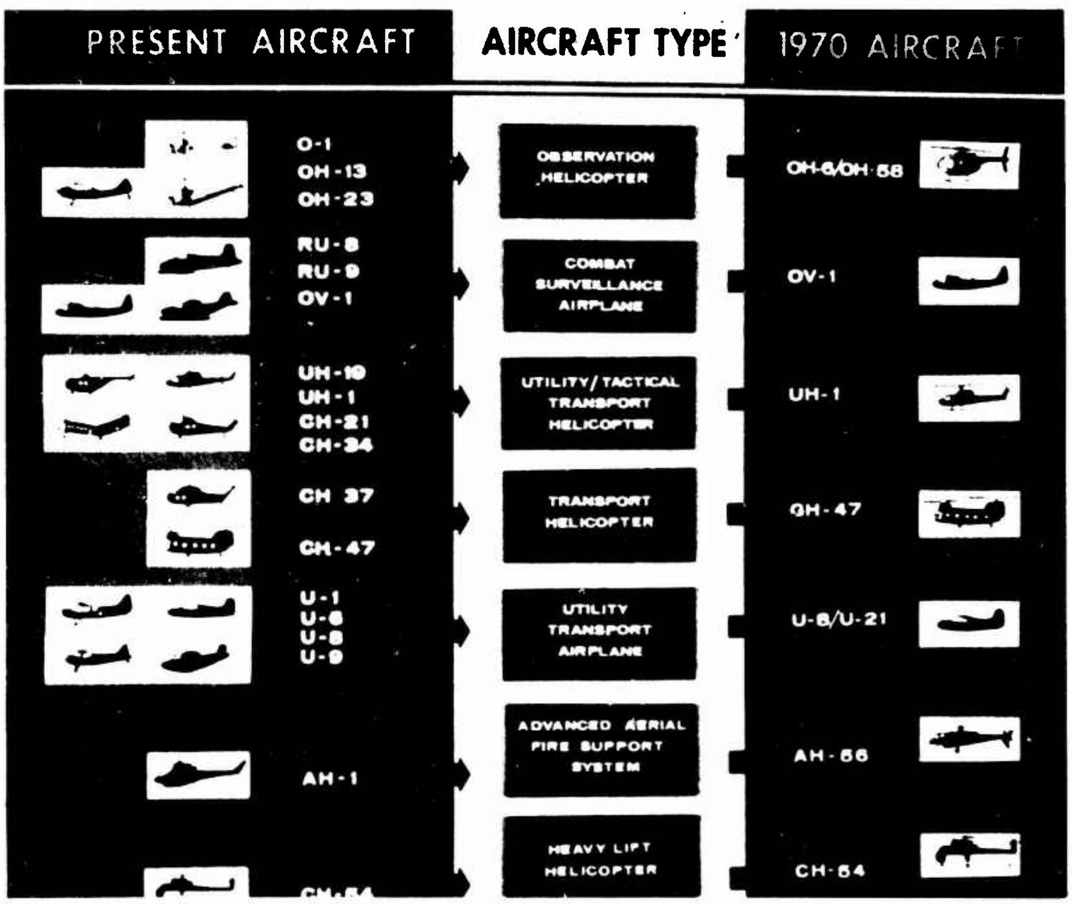


Figure 5

The growth of Army aviation has been steady. During World War II, an Infantry Division was authorized 11 aviators and 10 L-4 Observation aircraft, all in the Artillery units of division.

During the Korean War and through 1956, a division was authorized 36 aviators and 26 aircraft. The Division Headquarters, the Regiments or Combat Commands, the Engineer and Signal Battalions all had organic aviation, in addition to aviation in the Division Artillery. Essentially, aviation elements were decentralized throughout the division during that period

The Pentomic Infantry Division, introduced in 1956, had 76 aviators and 49 aircraft in their division aviation company. This organization was characterized by the centralized control of all organic aviation at division level.

The Road Division concept was introduced in 1963. It contained 128 aviators and 101 aircraft (97 helicopters and 4 airplanes). The present Road Division contains 144 aviators and 88 aircraft (all helicopters).

In the new Road Division, you will note that there is an increase of aviators and a decrease in the total number of aircraft. This reduction in total number of aircraft was accomplished by more efficient utilization and the larger passenger capacity of the new aircraft. The increase in aviators was demanded by flying in a combat environment and using more complex machines. The largest aviation unit within the Division is the Aviation Battalion. This unit contains observation helicopters and utility helicopters.

The First Air Cavalry Division contains 434 aircraft, and is the first new concept developed and put into the field since the advent of airborne and armored divisions during World War II. The primary means of mobility in this Division is its aircraft; whereas, the Road Divisions use ground vehicles as their primary means of mobility. One-third of the combat elements of the Airmobile Division may be airlifted in a single lift, using its own organic aircraft. The 1st Air Cavalry Division has proven itself so effective in active combat that a second Airmobile Division, officially designated the 101st Air Cavalry Division, was added to the books of U.S. Army Military Assistance Command, Vietnam on 1 July 1968.

At Corps and Army level, aircraft may be found within the Air Defense Brigade, separate Artillery Battalions, Corps Artillery, Armored Cavalry Regiments, Military Intelligence Battalions, separate aviation companies, and Engineer, Signal and Aviation groups. These units augment organic division aviation. The total aircraft strength within a field army is more than 3,000 aircraft.

By comparison, there were 200 aircraft in a field Army during World War II; from World War II until the current reorganization, there were approximately 900 aircraft; and now as already stated, there are about 3,000 aircraft within a field army

Today, Army aviation is a proven member of the Army's fighting team. Wherever the United States Army goes, its organic aviation goes with it. Army aviation elements serve in some 36 foreign nations, either as part of our forces, or as a member of various military assistance advisor groups, military missions, or on special projects.

The largest overseas concentration of Army aviation support is, of course, in Vietnam, where we now have approximately 4,000 aircraft and 8,000 aviators. Aviation elements of the U.S. Army, Vietnam, are performing a multitude of missions in support of US and free world forces. Missions of observation, troop airlift, aerial resupply, medical evacuation, artillery adjustment, target acquisition, and many others, are flown daily into Vietcong infested territory. Army aviation direct fire support is used to lessen the effect of Vietcong ground fire on troop-carrying helicopters.

Army aviation units and personnel are sometimes assigned special projects. These are performed either by assigning aircraft and crews from an existing Army unit, or by organizating a new unit for the sole purpose of supporting the special project. Examples of special aviation units include the 937th Engineer Company in Central America, the Aviation Company of a Special Forces Group, and the Aerial Crane company.

A special project in support of Geodetic Survey of operations is assigned to the 937th Engineer Aviation Company in Panama. This organization assists in survey and mapping operations throughout most of South and Central America. Army helicopters and airplanes are painted white for ease of spotting in case of a forced landing, and often perform missions several hundred miles across the jungles from their home base. Some specific missions include: airlift of survey equipment and personnel, aerial observation and mapping, aerial resupply of isolated survey crews, and aeromedical evacuation. Present testing of new helicopter-mounted equipment may result in a new capability for Army aircraft, that of an aerial survey instrument.

Army aviation plays an important role in all aspects of special warfare. Since no existing aviation unit could perform all the varied tasks required by special forces units, a Special Warfare Aviation Unit was formed early in 1962. This unit uses the UH-1 (Iroquois), and U-10 (Heliocourier) to perform aviation missions in support of stability operations. In addition, the Special Forces Aviation Company at Fort Bragg, North Carolina, has the mission of testing equipment and concepts related to special warfare operations.

Another aviation unit which is experimenting on equipment and concepts is the Aerial Artillery Battery at Fort Sill, Oklahoma. This unit is studying tactics and techniques related to utilizing aircraft as an aerial artillery piece. Tests have been conducted, firing the guided missile from the ground and rotating the helicopter without moving the skids. Future efforts will be aimed at developing an improved aerial artillery weapon.

The 478th Flying Crane Company was formed at Fort Benning, Georgia in March 1963, it had no aircraft assigned initially, but received three CH-37 (Mojaves) as interim aircraft. Upon delivery of four CH-54A Flying Cranes in the fall of 1964, the Company embarked on a series of exercises which were designed to evaluate the worth of the CH-54 and the aerial crane company concept. This helicopter is equipped with a unique hoist system and can lift 10 tons either in bulk cargo or capsule form. Missions performed by the Company included the airlift of troops, supplies, and equipment such as trucks and artillery; assisting in the building of bridges and the evacuation of downed aircraft. The 478th was deployed to Vietnam in 1965 and assigned to the 1st Air Cavalry Division. The formation of two additional companies in Vietnam attest to the successful employment of the heavy lift company.

Other special tasks performed by Army aviation in recent years include the support of local disaster relief operations, mercy missions, and riot control. Examples include the collision of two airliners over the Grand Canyon in 1956, an avalanche in Italy in 1963; the earthquake in Alaska, in 1964; the California floods in 1964 and 1965 and more recently the floods in Texas and New Mexico. Missions performed include the evacuation of injured and stranded people, the aerial delivery of medical supplies and food, and aerial reconnaissance to help determine the extent of damage.

Army aviation operations are widely spread over the world, and included the most diversified terrain and climate - from the snow-covered mountains of Alaska to the tropical rain forests of Panama; from the arid deserts of Africa and the Middle East to jungles of Vietnam.

The United States Army, through various research organizations, is constantly seeking new equipment and improving existing material for use in today's modern Army. In the field of Army aircraft and related equipment, government test and research agencies, along with civilian industry and research facilities, are continually striving to provide the best machines for Army aviation use.

In the constant search for improved firepower systems, the US Army is developing future concepts for aerial fire support systems, and is improving existing systems. The Lockheed advanced aerial fire support system (sometimes referred to as AAFSS) is an Army program that will provide the ground commander with an attack helicopter capable of delivering direct fire support with a wide variety of weapons systems far advanced over any presently in the Army inventory. The AH-56 completed its first flight in September 1967 and flight testing is continuing. Weapons systems that may be employed on this aircraft include; an air to ground missile, a 40mm grenade launcher, a 30mm gun, the 2.75 aerial rocket and an assortment of smaller caliber guns. The maximum speed of the AH-56 is expected to be over 220 knots. In addition to

the rigid rotor system, the aircraft has a pusher propeller to assist in high speed flight. This propeller can also be reversed in flight to provide braking action. The rigid rotor system allows the rotor blades to unload as the small wing surface carries more of the weight at high air speeds. The Army has ordered 375 attack helicopters for production. The first aircraft will be turned over to the Army for evaluation around September 1969. The first operational unit employing the AH-56 is scheduled for activation mid 1970.

Bell Helicopter's UH-LC (Iroquois), the armed helicopter currently being used in Vietnam, has been supplemented by the AH-1G (Huey-Cobra). This outgrowth of the Iroquois features an advanced flexible gun turret, the latest integrated armor protection for the crew and critical components, and four live hard-points for rocket and external stores on the wings. This aircraft is an interim attack helicopter to be employed until the AH-56 becomes operational. We presently have 150 AH-1's in Vietnam and a contract for the production of 700 more.

Studies are being conducted by several agencies in the field of increased speed, longer endurance, and more economical operation of helicopters. Several aircraft are now being tested. Still others are being designed and built. Lockheed's XH-51A ridig-rotor helicopter, featuring simplified rotor construction has attained speeds in excess of 267 knots. Bell Helicopter's high-speed version of the UH-1B (Iroquois), with two J-60 engines and stub wings, had resulted in a helicopter that can attain speeds in excess of 200 knots. Present testing is in the area of transition from rotary wing to fixed wing type controls as airspeed increases.

The Goodyear Aerospace Corporation has been awarded a contract for the design, development and production of 15 gliding air drop cargo systems. These systems will be capable of automatically delivering 500 pounds of cargo, from altitudes as high as 30,000 feet, to a ground radio transmitter, without regard to visibility. Portions of this system are being developed by Ryan Aeronautical Company which developed this system. These systems will silently glide, under electronic guidance to a landing with a ground accuracy of 200 feet. Since detection will be difficult, especially at night, this system can result in a great savings in lives and delivery aircraft. Testing is scheduled for the fall of 1968 at Yuma Proving Grounds.

The following two aircraft, the CL-945 and CH-806 were designed under the Army Composite Rotor Program. The Lockheed CL-945 combines the desirable features of a helicopter and the flight efficiency of a low-drag fixed wing aircraft. The helicopter rigid-rotor system provides positive control and stability plus a simple blade fold mechanism allowing the aircraft to function as a fixed wing airplane. The CL-945

is powered by two GE turboshaft engines, producing speeds up to 400 knots with a 3,000-pound payload.

A completely new concept in rotary wing flight is the CH-806. This aircraft will have a tilt prop rotor configuration, allowing it to hover as a helicopter, lift forward using the autogyro characteristics, and finally, performing as a fixed wing airplane. The CH-806 is a concept of the Hughes Tool and Aircraft Company. A drastic budget cut, high cost, and other priorities have resulted in an indefinite suspension of funding for both the CL-945 and the CH-806.

Army aviation research and development continues, not only in aircraft, but with associated equipment as well. A great deal has been accomplished in the field of avionics. The need for an all-weather, low-level navigation system has resulted in tests of several proposed systems. Presently in use in Army aircraft are Decca, a low frequency radio navigational system and doppler, a self contained navigational system. An inertial navigator is being evaluated for use in the OV-1 (Mohawk) aircraft. Development has been initiated on light weight, low-cost receivers from both aircraft and ground use.

A visual airborne target locator system is under development for the UH-1 helicopter. Basically it is electronic equipment designed to allow artillery units to deliver immediate fire on a target. The elimination of artillery adjustment adds to speed and surprise, and the fire becomes much more effective.

The Army's future development work will probably be aimed at putting more air-lift capability in individual aircraft and giving those aircraft an all-weather capability. Four major development projects are under study. These programs are aimed at replacing most of the aircraft inventory by 1980.

The performance profile for the utility tactical transport aircraft system, UTTAS, has been released to the aviation industry for evaluation as a preliminary to design of the aircraft. The performance and capabilities the Army desires in this aircraft are: (1) An 11 to 22 man payload of combat troops, (2) A cruise speed of 150 to 200 knots with an endurance of two to three hours, (3) The capacity to transport four to six litter patients, (4) A crew of three, two pilots and a crewchief, and an instrument flight capability equal to or better than the present UH-1. Plans are for this aircraft to replace the UH-1 series in the mid to late 1970's.

The Light Tactical Transport Aircraft System, LTTAS, will be designed as a replacement for the present CH-47 series of transport helicopters. At present this program has a relatively low priority.

Preliminary requirements for the heavy lift helicopter, HLH, have been released which would boost the lift capability to 20 to 50 tons. The target date for the heavy lift helicopters entry into the Army's inventory is 1975-1976.

The Manned Aerial Vehicle for Surveillance, MAVS, is a concept being looked upon to replace the present OV-1 series. Present work is limited to studies and development will probably not be accelerated until the bulk of UTTAS work has been completed. This machine is not limited to a helicopter-type approach, but will probably be a VTOL type machine if not a helicopter.

Army aviation has experienced steady growth since its birth on 6 June 1942, and has accelerated in the past 10 years. From 10 light observation airplanes per division during World War II, it has expanded to 88 aircraft per Road Division and 434 in the 1st Air Cavalry Division.

From some 200 airplanes per field army, we now see 3,000 aircraft within a field army; from being organic only to field artillery, Army aviation is now organic to 8 branches. From having only one mission, that of aerial observation, it now supports all five ground combat functions.

This growth is attributed to the demonstrated valuable services Army aviation rendered during World War II, in the Korean War, and now during operations in Vietnam. Army aviators have not forced this growth. The using ground units and unit commanders have initiated and demanded many of the functions and missions that today are considered established doctrine and procedures.

Army aviation growth has not yet reached its peak. The Army's creation of an airmobile division has opened new and broader usage of aviation in support of land warfare operations. The Army now has two Air Cavalry Divisions, the 1st Air Cavalry Division and the 101st Air Cavalry Division. The remaining divisions of the Army will have an airmobile capability improved over that currently in being. Within a decade, all of the divisions and corps airmobile units will be equipped with the newer aircraft. Army aviation's future growth and its capabilities are limited only by the imagination of the commanders and the professional competence of Army aviators.

AIRMOBILE OPERATIONS

PRESENTED BY DEPARTMENT OF TACTICS

Gentlemen, this briefing gives an indication of how General Kinnard feels toward the employment of airmobile forces within the 1st Cavalry Division. However, air mobility is not restricted to the 1st Cavalry Division but is employed extensively by all US and allied divisions in Vietnam. In fact, General Depew has jokingly referred to his division as the "1st Inf Div (Airmobile, Heavy)." Since airmobile operations comprise such a massive portion of the combat action in Vietnam, it is imperative that every Army aviator be intimately familiar with their principles. This is the reason airmobile operations is taught to every warrant officer and officer aviator graduating from this school. It is not only necessary for aviators to be knowledgeable of airmobile operations - it is essential that non-rated officers have the same familiarity because they will be the ones employing aviation units.

This morning, we are going to discuss considerations and techniques in planning and coordinating an airmobile operation. A typical combat action of the 1st Cavalry Division will be discussed illustrating how airmobile forces are actually employed.

Airmobility must be responsive to the needs of the ground commander. This is accomplished in the airmobile division by having massive aviation assets organic to the division. The other US divisions have their organic aviation battalion and in addition are provided support from an aviation battalion of the 1st Aviation Brigade, which is stationed in their area.

The command relationship between the infantry unit and the aviation unit may be one of operational control, attachment, or direct support depending upon the situation and the mission of the infantry unit. The command relationship must be one which provides the infantry unit commander with responsiveness and sufficient control to accomplish the mission.

Upon receipt of a mission to support a ground command, the aviation unit immediately establishes liaison with the supported unit. This is to ensure the closest coordination in the planning of the operator. Full time liaison officers from the supporting aviation unit are employed at both infantry and 1st Cavalry Division headquarters. Upon receipt of a support mission, the aviation unit provides an additional liaison officer to the subordinate infantry unit actually being air assaulted.

To understand how an airmobile assault is planned, it is first necessary to know the key personnel who are involved. The first is the airmobile task force commander. He is the senior ground commander involved in the operation, normally an infantry brigade commander, and controls participating ground and aviation elements. Not normally an aviator, he requires aviation advice and receives this from the next key person, the mission commander. This officer is the senior aviation commander involved in the operation and is normally an aviation battalion commander. He controls the aviation units and provides the liaison officer to the supported unit. The next individual to be discussed is the lifted unit commander. He is normally an infantry battalion commander since this is the manuever element of a division and he is, of course, subordinate to the airmobile task force commander. He may, in small operations involving only an infantry battalion, be the airmobile task force commander. The last individual is the aviation unit commander, normally an aviation company commander. Subordinate to the mission commander, he is responsible for the internal control of the flight and may be the mission commander himself in small operations involving only his company.

During the conduct of an operation the first two key officers, the airmobile task force commander and the mission commander normally ride together in a specially equipped helicopter, the command and control helicopter.

The four key personnel we have discussed are the officers principally concerned with the planning of an airmobile operation. As a planning vehicle they frequently employ the inverse planning sequence. This is a procedure which ensures that all factors are considered and no details are omitted in the planning phase. It is sufficient to say that many aspects of the inverse planning sequence may be omitted during certain tactical operations requiring the utmost in speed and responsiveness. However, when time and the situation permit, a detailed plan of the operation will save resources for both the aviation and the lifted units.

(Fig 1) The inverse planning sequence considers first the ground tactical plan, followed by the landing plan, air movement plan, loading plan and staging plan. The ground tactical plan is considered first since this is the phase of the operation which must be supported by all the subsequence planning steps.

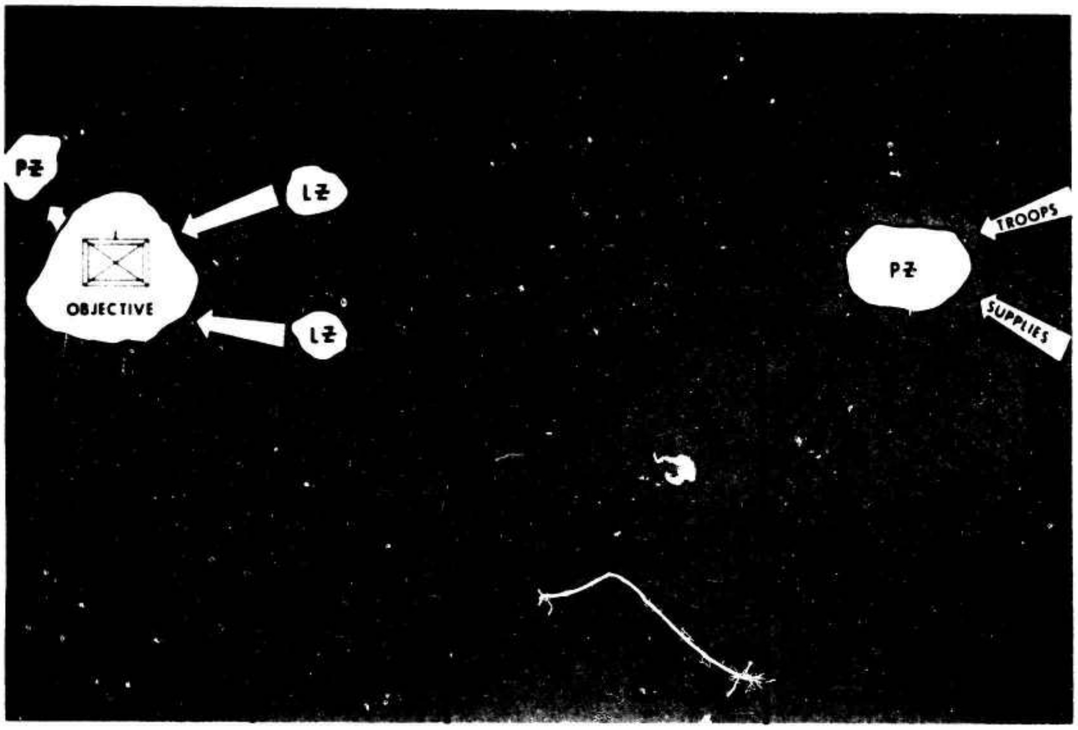


Figure 1

The ground tactical plan is the airmobile task force commander's ground plan to accomplish his assigned mission. It includes his scheme of manuever, fire support plan - including preparation of the landing zone area, resupply plan and extration plan.

The landing plan is next in the inverse planning sequence and includes the time, place and sequence of land of troops and equipment. The landing zones themselves are normally selected jointly by the ground commander (the airmobile task force commander) and the aviation commander (the mission commander). The aviation commander gives technical approval and the ground commander tactical and final approval. It is highly desirable that both these officers jointly perform an aerial reconnaissance of landing zone sites. Care, however, must be taken to avoid compromise of the operation. For instance, continuous overflight of the landing zone area must be avoided. Some of the desirable

characteristics which are considered in selecting suitable landing zones are that they be near the ground commander's objective, have cover and concealment, be near dominating terrain, have few obstacles, contain no known enemy positions, have good road nets, be safe from armor, and be easy to identify.

The next step in our inverse planning sequence is the air movement plan. This plan consists of two parts - the flight plan and the air movement table. Discussing the flight plan first, we must initially select a good flight route from the pickup zone to the landing zone. Characteristics desirable in a flight route are; that it deceives the enemy, avoids enemy positions, uses available weapon support, does not restrict friendly fires and is easy to navigate. Checkpoints may be established for control and for navigational assistance. (Fig 2) Some checkpoints employed are an initial point (IP), one or more air control points (ACP), a communications checkpoint (CCP), and a release point (RP).

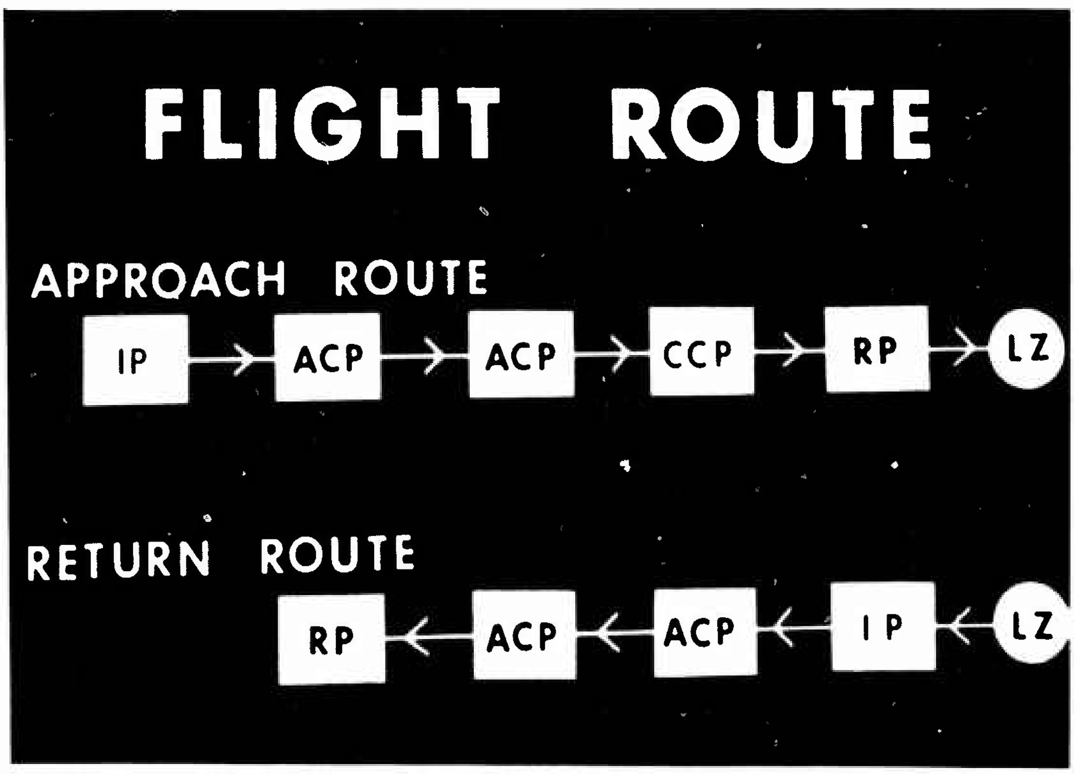


Figure 2

(Fig 3) The second part of the air movement plan, the air movement table is nothing more than a time schedule to ensure that all aircraft arrive at the LZ's at the prescribed time.

AIR ◇ MOVEMENT ◇ TABLE

SERIAL	AVN UNIT	NO ACFT	TRANS UNIT	NO SPACES	PZ	STA TIME	T/O TIME	SP TIME	RP TIME	LZ NO	LZ TIME
1	A/20 (+)	29	A,CO 1-71	NA	1/71	0558:00	0603:00	0606:00	0613:30	B	0615·0

Figure 3

The next step in the inverse planning sequence is the loading plan. An essential part of the loading plan is the air loading table which is normally a part of the lifted unit's SOP and which designates which troops and equipment go on which aircraft. The lifted unit commander prepares this table to maintain his tactical integrity and to ensure that all personnel carry all combat gear, that there is ammo with each weapon, that key personnel split up, that crews are with their crew-served weapons and that all accessories accompany each piece of equipment. Also considered in the loading plan are the actions performed in

the pickup zone (Fig 4) where we find the loads control group and the loading zone control center. The loads control group consists of individuals from the lifted unit who prepare all loads and load the aircraft in accordance with the loading plan. The loading zone control center normally consists of pathfinders from the aviation unit who establish air control in the pickup zone.

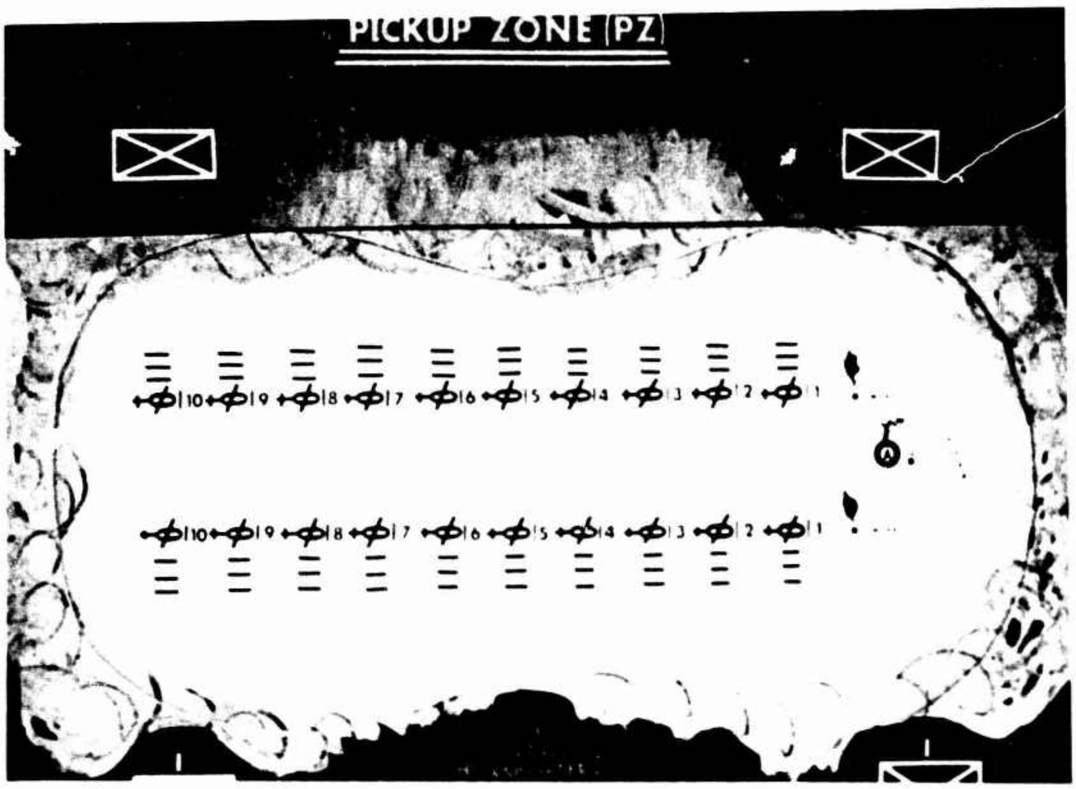


Figure 4

The last step in the inverse planning sequence is the staging plan which brings together the aircraft, troops and equipment along with any logistical, maintenance and medical support which may be required. Although there may be a separate staging area for the aircraft of the aviation unit, the pickup zone itself most commonly serves this purpose. In the staging area we provide refueling facilities, maintenance teams,

recovery aircraft and medical teams (Dust-off). The lifted unit may also provide a standby reaction force to provide protection for downed aircraft or for subsequent employment in the objective area.

The airmobile force is not restricted to a length planning sequence such as we have just discussed but can respond on a moments notice. Operations of this type are more frequently conducted in the airmobile division, since its organization and aviation assets permit a more responsive technique to the ground commander. The reconnaissance elements within the 1st Cavalry Division frequently precipitate an airmobile assault. An example of this type of operation was the Battle of Tam Quan during Operation Pershing.

During the last week of November and early December of 1967, there was increased activity within the Bong Son Plains area with reports that the 22d NVA Regiment headquarters had moved into the Tam Quan area. By 5 December, reports indicated major attacks were planned on Tam Quan and ARVN installations in the area. Also, attacks on outposts and bridges along Highway 1 had increased significantly in recent weeks.

Late in the afternoon on 6 December, the S-2, 1st Bde, 1st Cav Div, received a report that the 22d NVA regimental headquarters was located 1500 meters south of LZ "Tom". Scouts of "A" Troop, 1st Sqdn, 9th Air Cav, were sent to investigate. The scouts reported sighting an antenna and that they had received ground fire.

At 1630 hours, the aerorifle platoon (blues) of "A" Troop air assaulted into the area and were immediately pinned down by heavy automatic weapons fire.

At 1655 hours, the weapons platoon of "D" Troop, 1st Sqdn, 9th Cav, was air landed in the same area to reinforce but were unable to move as the heavy ground fire continued.

The 22d NVA had been located and the battle had begun.

The CO, 1st Bde, 1st Cav Div, and his staff formulated plans to destroy the enemy force. Essentially their plan was to use maximum firepower to destroy the enemy in his fighting positions with tactical air strikes and artillery; to use riot control agents (CS) to force the enemy from his implacements; to use all available forces to prevent his escape, and to maintain constant contact with the enemy.

At 1725 hours, the 1st Bde, 1st Cav Div, assumed control of the operation and directed the 1st Bn, 8th Cav, to airlift forces in the area of contact.

At 1800 hours, Co "B", 1st Bn, 8th Cav, air assaulted into the area and was joined by one armored cavalry assault vehicle (ACAV) platoon from Co "A", 1st Bn, 50th Inf (Mech) which moved over land from LZ "English". Co "B", 1st Bn, 8th Cav, attacked east but could not penetrate the enemy's defensive positions.

At 2100 hours, the two air cavalry platoons were extracted by air after Co "A", 1st Bn, 9th Inf and Co "B", 1st Bn, 8th Cav, had joined.

At 2200 hours, night defensive positions were established and ground movement ceased. Artillery fires continued throughout the night on likely withdrawal routes. UH-1's and Air Force flare ships provided continuous illumination. Waterways were patrolled by the aerial rocket artillery battery and helicopter gun teams.

The next day, 7 December, at 0725 hours, enemy defensive positions were hit with riot control agents (CS) delivered by the ARA battery followed by an artillery (HE) time on target (TOT) barrage.

At 0815 hours, Co "A", 1st Bn, 8th Cav, air assaulted into the area of contact and joined in the attack to the east.

At 0853 hours, another armored cavalry assault vehicle platoon and two twin 40mm (pusher) units joined the force, arriving over land from LZ "Loboy".

At 0915 hours, Co "B" and Co "C", 2d Bn, 8th Cav, completed air assaults to the east of the area of contact to prevent enemy escape.

Meanwhile the 1st Bn, 40th Inf (ARVN) conducted operations to the north to inhibit enemy withdrawal in that direction. The 4th Bn, 40th Inf (ARVN) operated to the south with the same mission. The enemy was now surrounded.

At 0920 hours, Co "D", 1st Bn, 50th Inf (Mech) joined the attacking task force.

At 1406 hours, the task force attacked to the east using flame throwers and ACAV, and successfully penetrated the enemy positions.

Meanwhile, the 2d Bn, 8th Cav, was meeting only light resistance while moving west. The 1st Bn, 40th Inf, engaged in heavy contact with the enemy trying to escape to the north.

At 1900 hours, all units closed night defensive positions.

The Battle of Tam Quan lasted fourteen days and was characterized by rapid reaction to intelligence with an air reconnaissance, followed by a ground reconnaissance to develop the situation, air assaults of reinforcements, and final control of the area of contact by battalion sized units. Results of both US and ARVN operations were 650 enemy killed. US casualties numbered, 58 killed in action. ARVN casualties were 30 killed in action.

This is just another instance in which the immediate responsiveness and superior mobility provided the ground commander by Army aviation resulted in a successful combat action.

As aviators our constant goal must be to provide this service.

I would like to conclude with a quote by General Creighton W. Abrams, "It has always been interesting for me to note that the avaitors and men of aviation units in Vietnam have been taken into the brotherhood of the combat arms. Not be regulation, not by politics, but they have been voted in by the infantry, who are the chartered members of that secluded club, the combat arms."

TACTICAL FLIGHT TRAINING

PRESENTED BY DEPARTMENT OF TACTICS

Gentlemen, our mission is to insure that each officer and each warrant officer who graduates from this school is fully qualified to perform any tactical flight mission which may be required of him, once he becomes a member of an aviation unit in Vietnam.

The basic entry student arrives in the Department of Tactics after having completed 28 weeks of training. During this time he has learned to fly his aircraft. It is now our responsibility to teach him to apply this skill in performing operational missions in a tactical environment. In effect we receive a pilot and graduate an Army aviator.

We are constantly updating our training program to provide student training in those operations currently being conducted by units in the field. Naturally, at this time, our program is oriented toward combat operations being conducted in Vietnam. This department is adequately staffed to perform this mission, since virtually all of our instructor personnel are Vietnam returnees.

The new training program being conducted by the Department of Tactics emphasizes the tactical application of Army aviation. This program is divided into two phases. During Phase I, the student receives classroom instruction and closely monitored flight instruction. During Phase II, he participates in a tactical field exercise, putting into practice all those skills he has acquired during his previous aviation training.

We train each student as an individual; however, to create a more meaningful tactical atmosphere, we integrate each student into a type aviation unit. So, from the first day the student arrives in the Department of Tactics, he is a member of an aviation unit. Figure 1 depicts a nondivisional combat aviation battalion, a type presently found in Vietnam. Each rotary wing student is assigned to one of these assault helicopter companies. Each fixed wing student is assigned to the Reconnaissance Airplane Company.

The student is told at this time that his unit is in a secure area, training filler personnel; however, it is anticipated that once this training is completed, his unit will be committed to a combat operational area. It is in this environment that the student completes his first 10 days of training in the Department of Tactics.

NONDIVISIONAL COMBAT AVIATION BATTALION

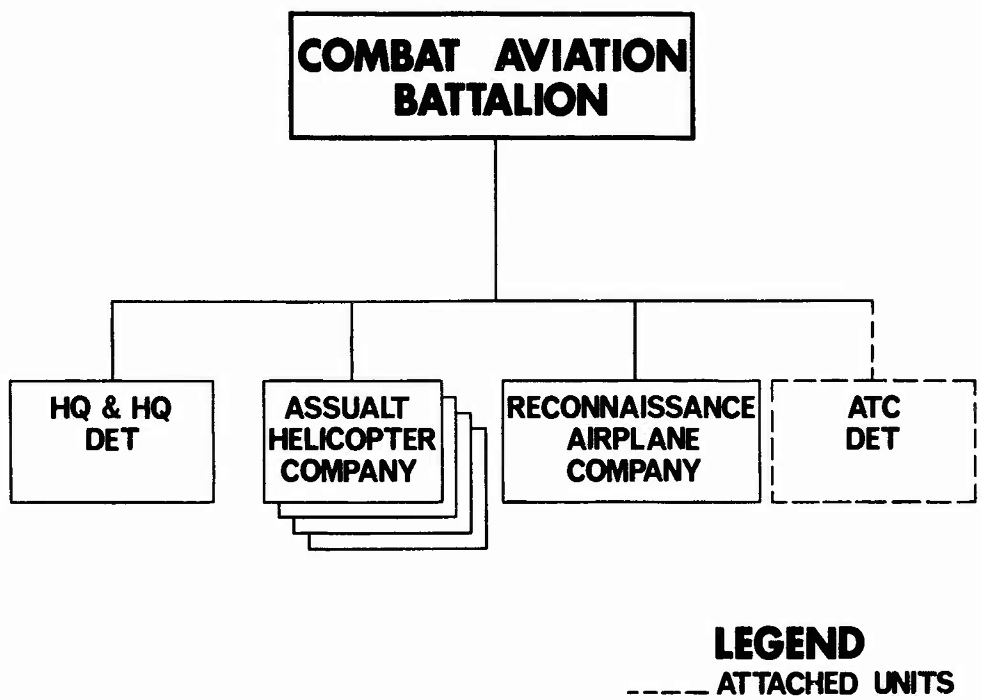


Figure 1

All tactical flight training is conducted at two base airfields: TAC 1, our present location, and TAC X, approximately 15 miles southeast of our location. The facilities at each base airfield are similar. The major difference being, at TAC 1, we conduct both fixed and rotary wing training, while at TAC X, we conduct only rotary wing training. (Figure 2) TAC 1. Fixed wing training is conducted on the east side of the field. There is sufficient space for a runway and parking area for 30 fixed wing aircraft. The operations building and the bivouac area for 50 fixed wing students are also located on the east side of the field. Rotary wing training is conducted on the west side of the field. There are two landing H's on the north heliport and a single landing H in the south heliport. Rotary wing aircraft are parked along the west, the north, and the east sides of the south heliport and along the west and north sides of the north heliport. This provides parking area for the 65 aircraft required in the conduct of this training. This is also true at TAC X. Rotary wing operations and the bivouac area are located on the west side. Like facilities are available at TAC X. The following facilities support both fixed and rotary wing: a civilian contract maintenance agency; civilian contract refueling trucks; a flight coordination center, which receives position reports from student

aircraft; a permanent tower; a crash rescue crew, which is on duty during all periods of flight instruction; and mess facilities for students, instructors, and support personnel. The ground control radar unit is located in the north end of the north heliport. Approximately three miles west of our location there is a nondirectional beacon. Figure 3 depicts that training which the student receives during Phase I. During his classroom instruction, he receives training on the organization and employment of Army aviation units. In addition, he receives instruction on that equipment which these units are using during operational missions. Survival, escape, and evasion is taught at a special field site. Here, the student receives 12 hours of instruction on the techniques of survival, escape, and evasion and then participates in a 14 hour field exercise. During this time, agressor personnel patrol the area, and should the student be captured, he is taken to a prisoner of war camp and interrogated.

Figure 2

PHASE I

TACTICAL TRAINING

CLASSROOM INSTRUCTION
SURVIVAL, ESCAPE AND EVASION
AERIAL ARTILLERY ADJUSTMENT
AERIAL GUNNERY
RECONNAISSANCE
NAVIGATION
FORMATION
RESUPPLY
NIGHT
AIR TRAFFIC CONTROL
RAPID REACTION
TARGET MARKING

Figure 3

All students receive training in the classroom on aerial artillery adjustment procedures. We utilize the "puff board" demonstration technique. In addition, the fixed wing student receives 2½ hours of flight instruction where he has the opportunity to practice adjusting live artillery from his O-1 aircraft. Aerial gunnery is taught only to the rotary wing student. He receives 15 hours of familiarization training on the UH-1 armament subsystems. 25% of the students receive a gunnery oriented pre-FEX and are qualified in the gun systems. The other 75% participate in 1 hour and 15 minutes of familiarization firing.

Reconnaissance is taught, utilizing area, landing zone, and route reconnaissance techniques. For the area portion of the student's mission, he is sent to a specific area to search for downed aircraft or

enemy activity. During the landing zone reconnaissance, the student is to determine the suitability of the landing zone and the size airmobile force it would accommodate. For the route portion of his mission, he is to determine the vehicular trafficability of a given route. Emphasis is placed on the reconnaissance report. This report must be rendered to the instructor pilot or the operations officer in exactly the same manner that he would have to render it to a ground commander in Vietnam.

Navigation is taught to the rotary wing student primarily at an altitude of 50 feet above the trees and to the fixed wing student primarily at an altitude of 100 feet above the trees. We feel it necessary that the student aviator be able to navigate at low level for two basic reasons: first, the weather is always a factor and may require that the planned flight altitude be lowered; secondly, the Viet Cong are continuing to improve their anti-aircraft capability. Further, we contend that if a student can navigate at low level, he can certainly navigate at a higher altitude.

We teach four methods of navigation: pilotage, which is a technique of correlating those objects on the map with those on the ground; dead reckoning, which involves maintaining a heading and then computing time, distance, and groundspeed to determine arrival over a certain point on the ground; FM homing, using the FM radio in the aircraft to home to a radio located at one of the field sites in our operation area; and decca, which is a low frequency signal providing a visual display of the aircraft's position on a map, as well as employing the aircraft's location by coordinates.

Formation flight is taught to the fixed wing student by Department of Fixed Wing. The rotary wing student receives intensive formation flight training from the Department of Tactics. He is taught four basic formations, which are presently used by units in Vietnam. These are the "V", trail, staggered trail, and the echelon. The student has the opportunity to execute numerous approaches into and takeoffs from landing sites within our operational area. He also must join up and break up those formations both on the ground and in the air. In addition, he is given a demonstration on the tactical heavy right and heavy left formations and a procedure to be followed in the event that the formation encounters inadvertent IFR conditions.

Resupply is taught to the fixed wing student utilizing small internal loads dropped from the rear window of the O-1 aircraft. The rotary wing student receives his initial internal loads training from the Department of Rotary Wing. Once he arrives in the Department of Tactics, he continues to fly a loaded aircraft, one which is loaded to a weight of 8400 pounds or in the caution area of the flight envelope. We also teach him external load techniques using various types of external loads. We have increased our load training by more than 50% during the past year.

We are continuing to place emphasis on the role of Army aviation during the hours of darkness. The student must participate in formation flight, navigate at 200 feet above the highest obstacles, and execute numerous approaches to and takeoffs from minimum lighted tactical landing sites within our operational area. Three field expedient devices are used to light our landing sites: flare pots, which consist of tin cans filled with sand and gasoline; panels illuminated by vehicle headlights; and flashlights attached to stakes driven into the ground. Once the student has mastered these skills, he should have no difficulty conducting night operations at even the most forward outpost in Vietnam.

Air traffic control procedures are integrated into most of our periods of flight instruction. The student is required to report designated air control points, giving an estimate to the next reporting point, thus preparing him for the type flight following system presently being used in Vietnam. Rapid reaction missions are integrated into both Phase I and Phase II flight training. The student is given the opportunity to plan all missions in advance; however, during the execution of some of these preplanned missions, he is called and told to abort his planned mission and to proceed on a newly assigned mission. In order to accomplish this, the student must constantly maintain flexibility in his flight planning.

Target marking has just recently been incorporated into the fixed wing student's program of instruction. During Phase I, he is taught to mark landing sites for airmobile forces and mark targets for armed helicopters using a smoke grenade thrown from the rear window of his O-1 aircraft. This concludes those subjects which the student receives during Phase I of his training.

I would like now to briefly describe a typical mission flown by the rotary wing student. Figure 4 shows a night mission, flown by the rotary wing student. The student must accomplish all training listed under the scope. It is a dual flight mission lasting 1 hour and 15 minutes. The student receives advance planning information in the form of an operations order. He is then briefed by the operations officer and again by his platoon leader and his instructor pilot prior to the execution of this mission. There are three platoons involved in this mission and three routes, one route for each platoon. Each platoon is broken down into "V's" of three aircraft. The first element of the first platoon will depart TAC 1 in a "V" of three and will proceed directly to the location of "B" Company, 1st Bn 72d Inf. They will fly at an altitude of 200 feet above the highest obstacle. Prior to arriving at the location, the student must determine the call sign and the frequency of the ground unit by the use of his signal operation instructions. After receiving essential information, such as the enemy situation, wind direction, obstacles, and a recommended direction of landing from the ground personnel, the "V" of three would then execute

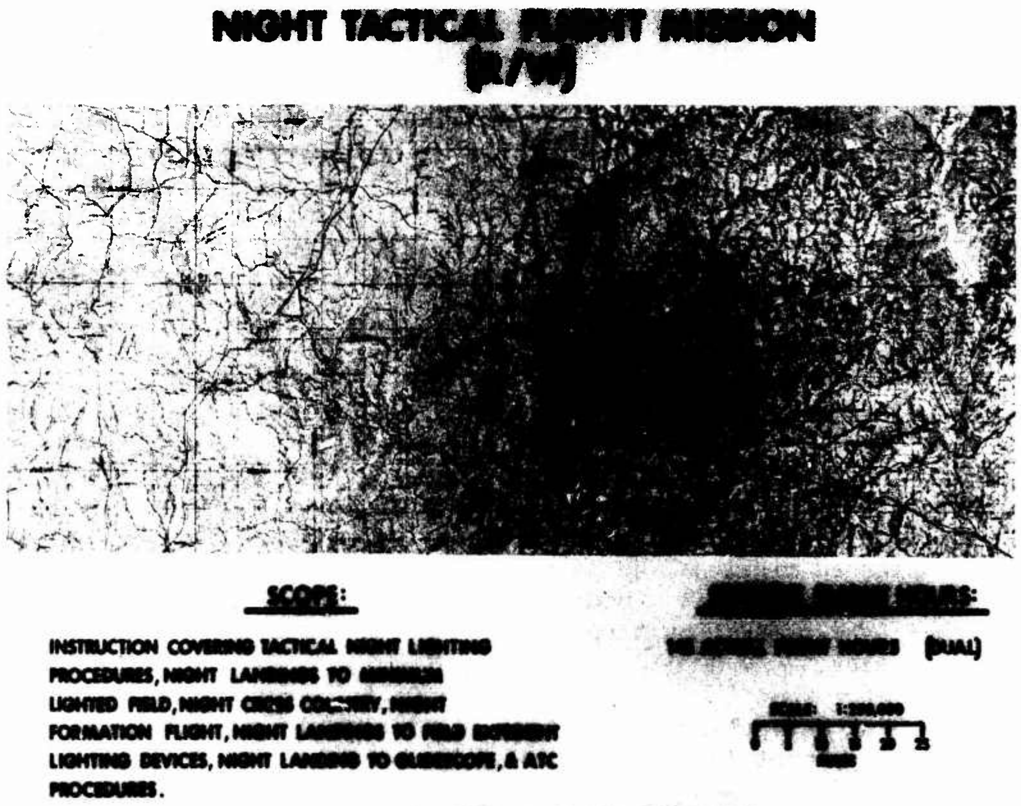


Figure 4

a formation approach to this landing site. This landing site is lighted by flare pots. The formation makes an approach to the ground and then immediately departs this location. The lead of the formation is changed prior to takeoff. They then proceed directly to 1st "A" Team, 15th Special Forces. Here the landing site is lighted by vehicle headlights illuminating a panel on the ground. Again, after receiving the essential information from the ground unit, a formation approach is executed. They depart this landing site, changing formation leads once again, thereby allowing each student to lead the formation, and proceed to "A" Company, 1st Bn, 72d Inf. Again, a formation approach is made to this location. This landing site is lighted by flashlights attached to stakes driven into the ground. They takeoff from this location, breaking up the formation, and conduct single ship training at this location. When the single ship training is finished, they proceed back to TAC 1, execute an approach using the glide scope, the students are debriefed, the aircraft refueled, and the students switch seats. The student who had been flying as pilot now acts as the co-pilot/navigator, and the co-pilot/navigator becomes the pilot. They depart TAC 1 flying

a different route. The other two elements fly the mission in the same manner except they conduct their single ship training at the other landing sites.

During Phase I, the rotary wing student has flown 14 hours as the student pilot and 14 hours as student co-pilot/navigator for a total time of 28 hours in the aircraft. He is now prepared to go into the tactical field exercise portion of his training. At this time, the students are transferred to TAC X and given a tactical situation. All students live in the field during their last two weeks of training.

PHASE II

ROTARY WING TACTICAL TRAINING

AIRMOBILE OPERATIONS

ARMED ESCORT

RECONNAISSANCE

FLIGHT EXAMINATION

Figure 5

During Phase II of the rotary wing student's tactical training, emphasis is placed on company and platoon size airmobile operations. These operations involve troop movements, resupply missions, and medical evacuation missions.

One platoon from each company is designated as the armed escort platoon. These aircraft do not actually mount weapons; however, they do perform those missions normally performed by the armed aircraft in Vietnam. They perform a reconnaissance of the route to the landing zone, perform a reconnaissance of the landing zone, apply direct fires when necessary, and vector the unarmed aircraft to the landing zones.

Continued emphasis is placed on reconnaissance missions both day and night, and toward the end of the tactical field exercise, the student is given a comprehensive flight examination covering all that training which he has received.

Figure 6 depicts a typical mission flown by the rotary wing student during the tactical field exercise portion of his training. The students are told to report to the briefing tent for a mission briefing. Here they are briefed by the operations officer and given an operations order to aid them in their planning. The situation given the student is that they are to airlift a special forces unit along with supplies and equipment into an insecure landing zone. The execution of the mission is as follows: The first platoon, which is designated as the armed platoon, departs homeplate five minutes ahead of the two cargo platoons. The armed platoon proceeds directly to the landing zone, performs a reconnaissance of the landing zone, and applies direct fires, since there are aggressor forces located in the landing zone. Five minutes later, the second platoon, which is designated as the internally loaded platoon and is loaded to approximately 8,400 pounds, arrives at the landing zone. They are vectored into the landing zone by the armed platoon, simulate off loading of troops, and immediately depart the landing zone and proceed to staging area "Jenny." The third platoon, which is the externally loaded platoon, arrives at the landing zone 30 seconds after the internally loaded platoon has departed. They leave their external loads at the landing zone and also proceed to staging area "Jenny," escorted by the armed platoon. Once all three platoons arrive at the staging area, they receive separate platoon missions. The armed platoon is directed to proceed directly to "A" Company, 1st Bn, 72d Reconnaissance Mission. There are agressor forces located in this area, and these aircraft will be fired upon by agressor forces. They must render a reconnaissance report to the operations officer once they arrive at homeplate. The second platoon is directed to proceed to "B" Company, 2d Bn of the Popular Forces with the mission of picking up captured material and personnel and transporting them back to homeplate. However, once they arrive at this location, they are advised that the

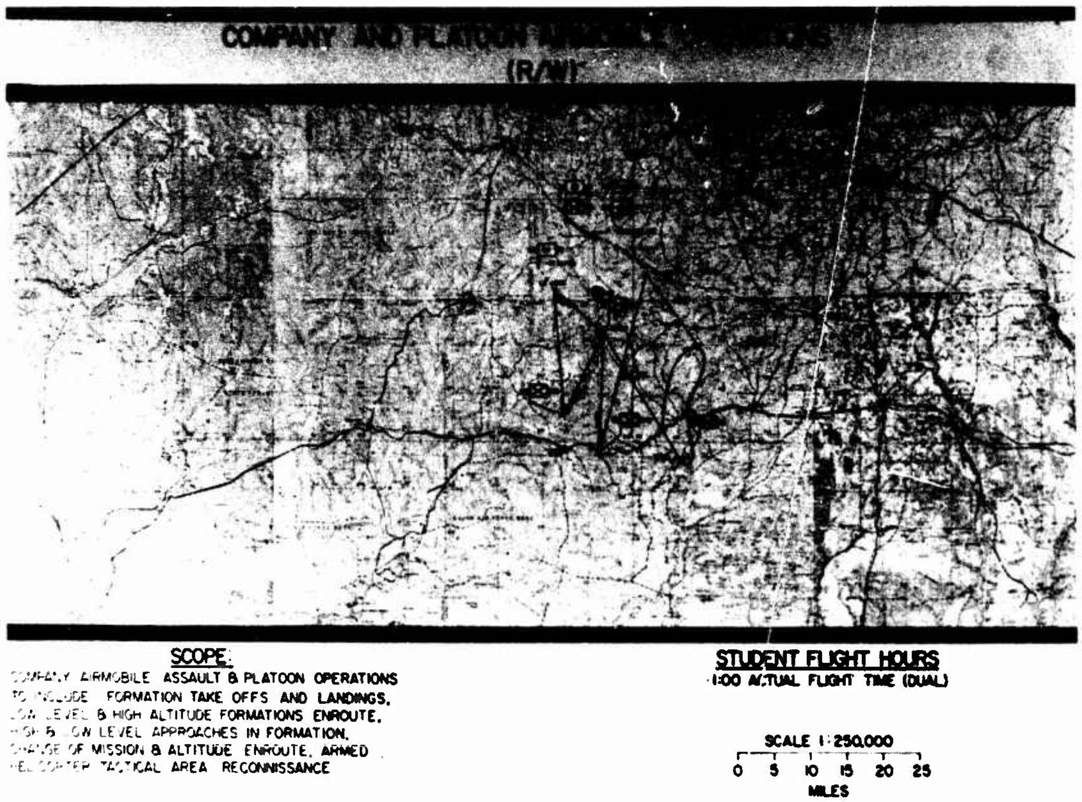


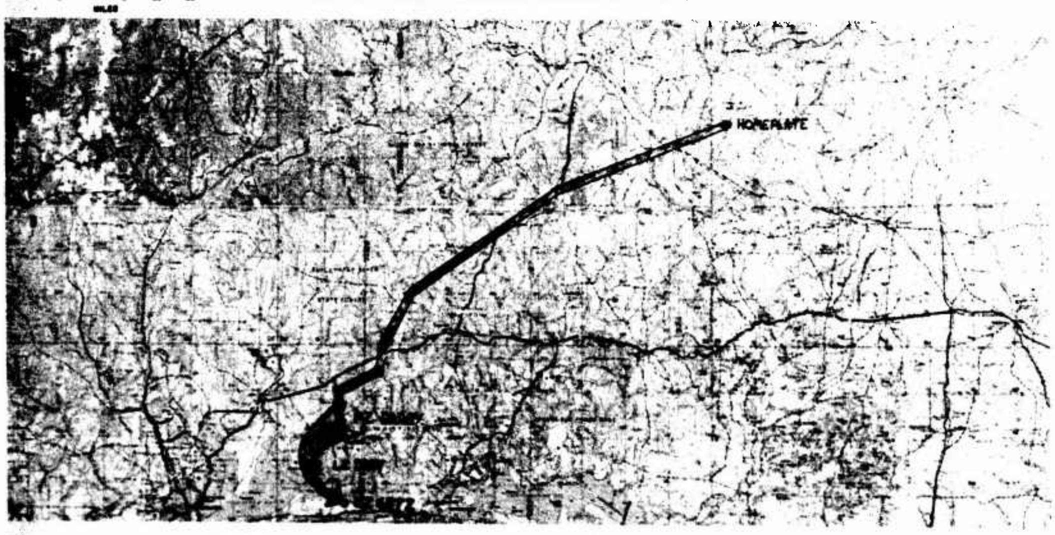
Figure 6

weather conditions at homeplate have deteriorated. The platoon leader must then establish time and altitude separation between aircraft and proceed directly to the nondirectional beacon. Here they execute a tactical, nondirectional beacon approach. They do not break out of the simulated weather and must execute a missed approach and call the ground control radar unit located at homeplate for a vector to the final approach course. The third platoon is informed to proceed to "C" Company, 2d Bn Popular Forces and pick up "Strike" personnel or re-enforcing personnel and take them to the landing zone. Once this is accomplished, they pick up their external loads and bring them back to homeplate. This mission is flown a total of 6 times, allowing each student to fly and navigate as a member of the armed platoon, the internally loaded platoon, and the externally loaded platoon.

Figure 7 depicts the airmobile operation flown by the rotary wing student during his last week of training. It is an integrated operation conducted jointly by the Aviation School and the Infantry School

SCALE: 1:250,000

COMPANY AND PLATOON AIRMOBILE OPERATIONS



SCOPE

COMPANY & PLATOON AIRMOBILE OPERATIONS TO INCLUDE: TACTICAL TROOPLIFT, FORMATION TAKE-OFFS & LANDINGS, LOW LEVEL FORMATION EN-ROUTE, LOW LEVEL APPROACHES IN FORMATION, LOW LEVEL XC NAVIGATION WITH INTEGRATED ADF & VOR TRACKING, ARMED HELICOPTER ESCORT & LANDING ZONE RECONNAISSANCE, RAPID REFUELING (ENGINES RUNNING).

STUDENT FLIGHT HOURS

01:15 ACTUAL FLIGHT HOURS (DUAL)

Figure 7

at Fort Benning, Georgia. The students receive that training listed under the scope. This mission does incorporate a tactical trooplift and rapid refueling. The students are told that their unit will conduct an airmobile assault. A ranger company will be lifted from PZ Darby and transported to LZ Getz, an insecure LZ near the Gulf of Mexico. The ranger company will conduct an ambush of aggressor personnel who are using the river as a supply route. The mission is flown generally as follows: The 3 platoons of the 1st Company depart in platoon formation at 5 minute intervals with the armed escort platoon in the lead. The armed platoon conducts a recon of the PZ and then provides cover for the lift helicopters. Upon completion of the troop lift, the platoons return to this point to receive rapid refueling (engines running) and to switch students. They depart the refueling point and return to TAC X. The 2nd Company flies this mission in the same manner 30 minutes behind the 1st Company. We consider this the most realistic training in our program. Both the ranger students and the helicopter students gain valuable experience in tactical airmobile operations.

PHASE II

FIXED WING TACTICAL TRAINING

TACTICAL APPLICATION

OBSERVING AND REPORTING ENEMY ACTIVITY

SELECTION OF AIRFIELDS AND LANDING ZONES

LANDING ZONE AND TARGET MARKING

CONVOY ESCORT

RADIO RELAY

FLIGHT EXAMINATION

Figure 8

Figure 8 depicts that training given to the fixed wing student during the tactical field exercise. The fixed wing student has the opportunity to continue to practice those skills which he has acquired during Phase I. In addition, he receives training in observing and reporting enemy activity. This has long been a fixed wing mission. He receives training on the selection of airfields and landing zones. He receives continued training in marking landing sites for airmobile forces and selecting targets for the armed helicopter. During Phase I this was done by throwing smoke grenades from the aircraft. During Phase II it is done with a 2.75 smoke rocket. He receives training in convoy escort and radio relay. He also receives a flight examination at the end of Phase II covering all training which he has received.

Since during the FEX we are operating under a 4:1 ratio, four students to one instructor pilot, as well as four students assigned to each aircraft, only half of the students are flying at any one time. During that time the student is not actively engaged in flying or receiving a briefing pertaining to his flight mission, he is receiving concurrent training. This training involves those subjects shown in Figure 9. If there are any questions concerning any subject, I will answer them.

CONCURRENT AVIATOR TRAINING

ESTABLISHMENT AND DEFENSE OF AIRFIELDS

MISSION PLANNING

GROUND, MORTAR AND AIR ATTACKS

PATHFINDER OPERATIONS

CAMOUFLAGE AND CONCEALMENT

COMMUNICATIONS SECURITY

AIRCREW AND AIRCRAFT ARMOR PROTECTION

FIELD REFUELING

MEDICAL EVACUATION

LOADING AND LASHING

Figure 9

DEPARTMENT OF TACTICS

OBJECTIVE

TO PROVIDE THE ARMY AVIATION UNIT COMMANDERS IN VIETNAM WITH REPLACEMENT AVIATORS CAPABLE OF IMMEDIATE EMPLOYMENT IN OPERATIONAL UNITS.

Figure 10

In conclusion, we will continue to evaluate and update our training program, insuring that at all times we are accomplishing our objective, as shown in Figure 10.

PRESENTATION BY THE DEPARTMENT OF TACTICS

AVIATION ARMAMENT DIVISION

Welcome to Matteson Range, the birthplace of the armed helicopter. Here, in 1956, in an effort to determine the feasibility of arming helicopters, an OH-13 was equipped with (2) fixed .30 caliber machine guns and test fired. We have progressed since that time.

As commander/instructor you will be expected to know the nomenclature, capabilities and limitations of current helicopter weapons and ammunition. Since one limiting factor of weapons effectiveness is the man firing it, you also need to be familiar with the training of this man.

During the next hour, we will discuss the gunnery training programs of instruction and the range facilities available at Fort Rucker. During the second hour, you will be given the opportunity to ride with the students, observing their training in progress. If you have questions at any time during your briefing, feel free to ask them. The briefing is informal, and your questions are welcomed.

The primary mission of Aviation Armament Division is to conduct gunnery training. However, we are also responsible for writing, reviewing, and revising official publications relating to helicopter gunnery, and coordinating with other agencies, both military and civilian, in the development of doctrine, concepts, and weapons systems.

The scope of our gunnery training program is as you see in figure 1. To give you a feel for the numbers represented here, the Initial Entry Qualification Course, for example, consists of 96 students per month. As for the ammunition requirements, for all courses we fire in the vicinity of 2½ million rounds of 7.62mm monthly.

The physical plant required to conduct this training consists of six aerial fire ranges and one tower range (shown in figure 2) all of which use a common impact area. Five of the aerial fire ranges can be used for aviator training; the sixth aerial range and the tower range are used for door gunner training.

Figure 4 shows the range layout. The size of the firing lane depends primarily on the aircraft being used. Here at Fort Rucker, we use only the UH-1B and our firing lanes are 400 meters by 1600 meters. The length of the impact area depends upon the ammunition used. For rockets, this length is 7400 meters, and for 7.62mm - 3200 meters. Here at the Aviation School, because we have qualified instructor

AVIATION ARMAMENT DIVISION

GUNNERY TRAINING PROGRAM

COURSE	MONTHLY INPUT	AMMO
INITIAL ENTRY QUALIFICATION		7.62, 2.75, 40, 50
INITIAL ENTRY FAMILIARIZATION		7.62
ROTARY WING QUALIFICATION (PHASE IV)	(22)	50, 7.62, 2.75
M-22 QUALIFICATION	(4)	AGM-22B
UH-1 INSTRUCTOR PILOT QUALIFICATION	(8)	7.62, 2.75, 50, 40, FLARE
LOH INSTRUCTOR PILOT QUALIFICATION	(8)	7.62, FLARE
DOOR GUNNER FAMILIARIZATION (67N20)	(540)	7.62
DOOR GUNNER QUALIFICATION (67A1F)	(140)	7.62, SMOKE

Figure 1

FORT RUCKER
AERIAL GUNNERY RANGES

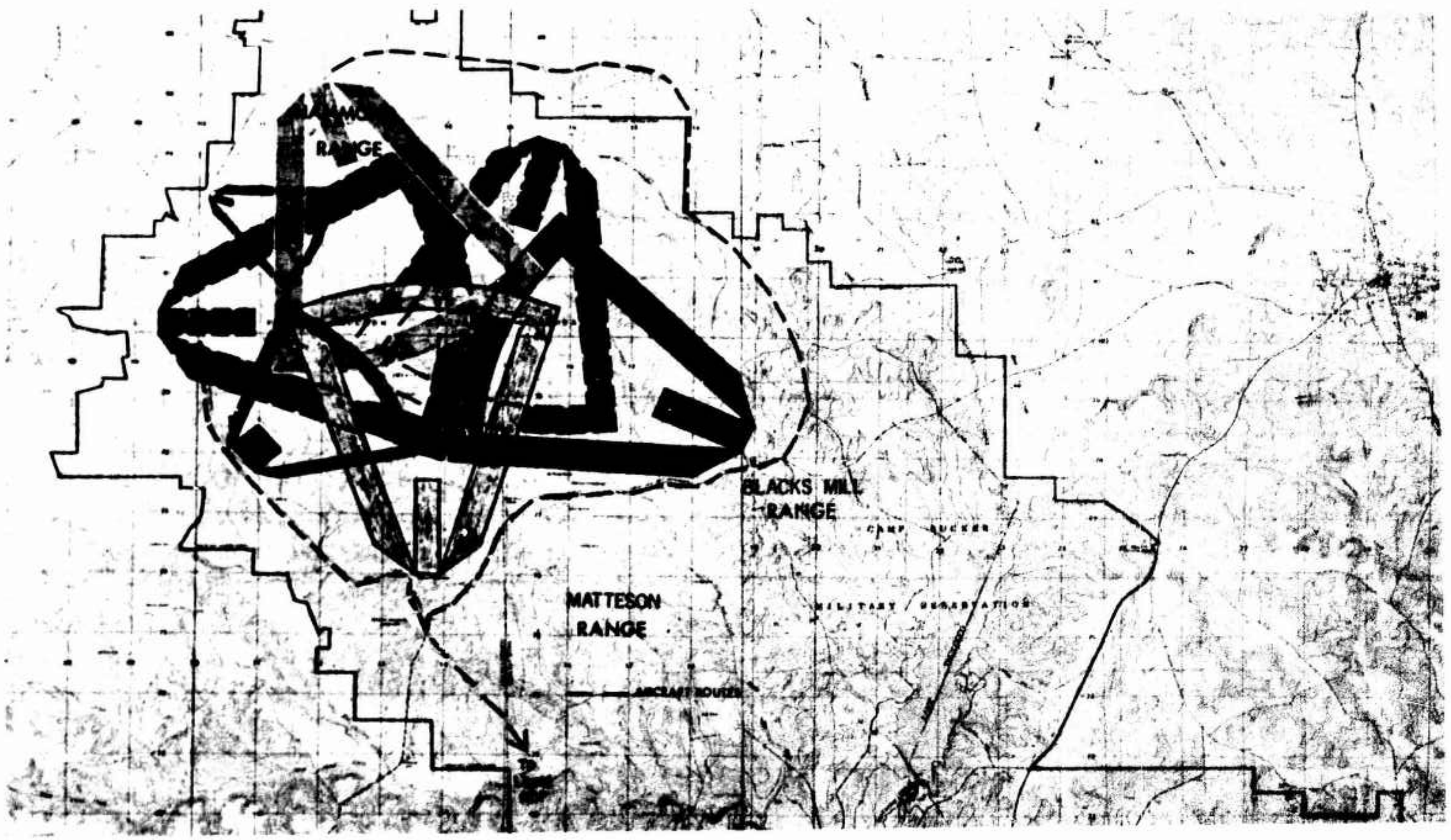
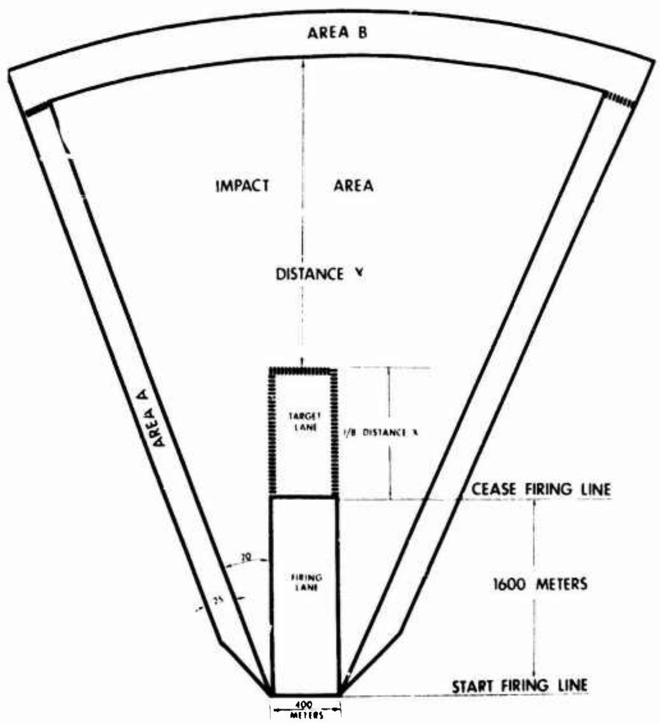


Figure 2

AERIAL FIRE RANGE SURFACE DANGER AREA



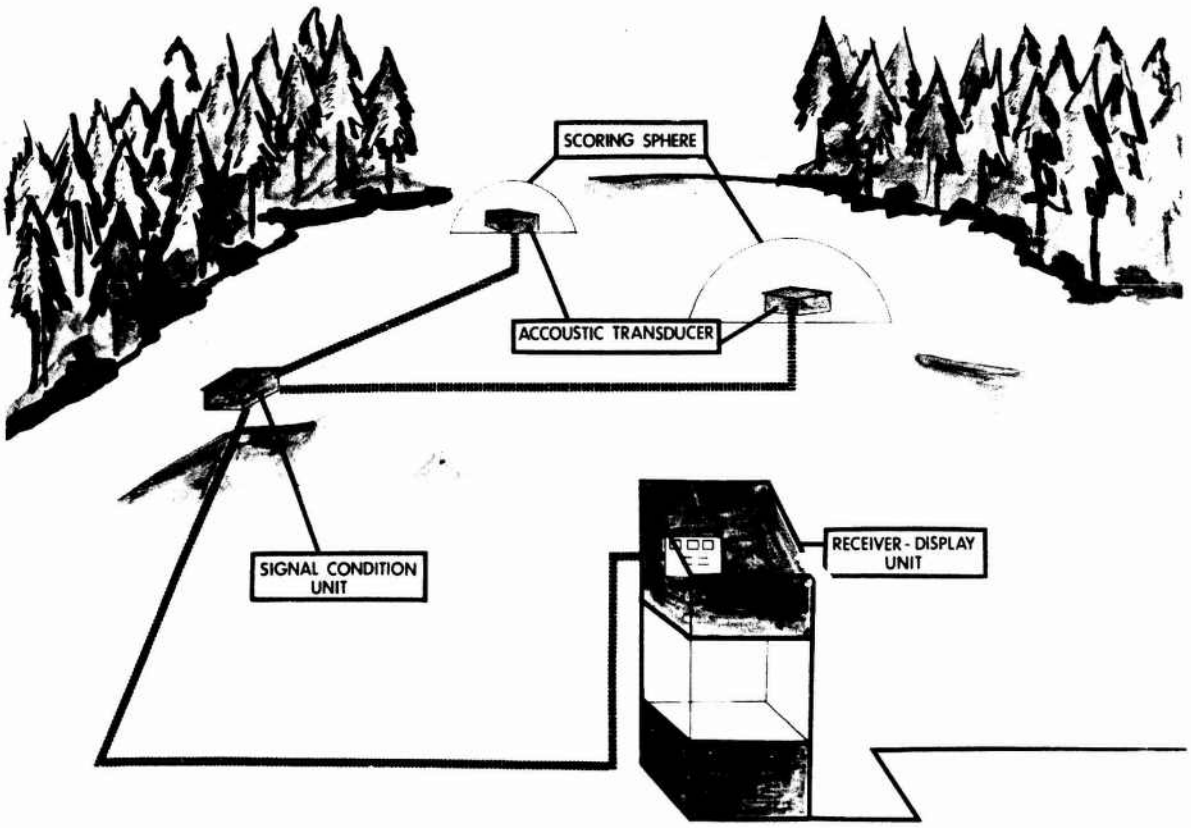
DIMENSIONS
[IN METERS]

WEAPON	AREA A	AREA B	DISTANCE X
2.75" FFAR	300	300	5400
40MM (M75)	200	200	2100
7.62 MM	100	100	2700

Figure 3

pilots on every aircraft, we have been authorized to cut these distances to 5400 meters for rockets and 2800 meters for 7.62mm. Targets are placed in the firing lane and in the target lane, but must be fired at while the aircraft is in the firing lane.

Until recently, all scoring on our ranges was done by guesstimation by the instructor pilot. We are not in the process of installing accoustic scoring devices on four of our ranges. A drawing of this system is shown in figure 4. When a projectile penetrates the scoring sphere, it is sensed accoustically by the transducer. This signal then goes to the signal conditioning and transmitting unit where it is converted to electrical energy and transmitted to the tower. In the tower, we have the receiver and display unit. This unit can give a variety of readouts depending upon the needs. It can indicate number of hits (up to 6000 per minute), and miss-distance.



ACCOUSTIC RANGE SCORING SYSTEM

Figure 4

One of the reasons we decided on using the accoustic scoring method rather than radar or some other method was because it is an inexpensive way to score the varied mutions used by attack helicopters.

The following is a description of the weapons systems we use.

HELICOPTER ARMAMENT SUBSYSTEMS

AGM-22B

Shipped as a complete round of ammunition, the AGM-22B missile is separated into two components: the warhead and the missile body section. The missile batteries are shipped separately, due to low shelf-life of the battery.

The AGM-22B missile may be fitted with either a shaped-charge HEAT (High Explosive Anti-Tank) warhead or an inert practice warhead. Some HE (High Explosive) warheads were purchased to test the applicability of using this round for anti-personnel. The warhead is armed 3.5 seconds after launch by gas pressure from the missile motor. Upon impact with the target, a weighted striker penetrates and sets off the explosive detonator and the main charge in the warhead.

Two solid-propellant rocket motors propel the missile. Initial acceleration is provided by the booster motor which burns for 1.2 seconds and accelerates the missile to approximacely 195 mph. The dual exhause ports for the booster motor are positioned on opposite sides of the missile. Approximately 0.6 seconds before booster motor burnout, hot gases from the booster motor ignite the sustainer motor. The sustainer motor burns for 20-22 seconds (depending on the temperature) and accelerates the missile up to approximately 425 mph. Exhaust from the sustainer motor is channeled through a connecting tube in the center of the missile to the exhaust nozzle at the rear.

Guidance control of the missile is accomplished by a wire-command-link, a decoder, a gyroscopic distributor, and a jet deflector assembly. Commands from the gunner go over the wires to the decoder, which detects and amplifies the commands. These amplified signals go to the gyroscopic distributor which relays the signal to the appropriate jet deflector, forcing it into the exhaust stream to control the missile.

3300 meters of wire are contained in each bobbin. The wires are specially coated to prevent short circuits as the wire becomes twisted in flight. The four lifting wings are offset to the centerline to cause the missile to spin for better control. The missile, for daytime use, has two pyrotechnic tracking flares to aid the gunner in following its flight.

Each missile weighs approximately 64 pounds and costs $1200-$1500. With its ability to penetrate 23 inches of homogeneous armor plate,

it is capable of destroying any known tank. Additionally, each missile has, built into its guidance system, a safety feature which causes it to take a down-right trajectory in the event a wire should break or for any reason the missile does not receive commands.

M22

The M22 helicopter-mounted, wire-guided missile subsystem, designed and developed by Nord Aviation of France, weighs approximately 683 pounds.

The subsystem consists of six missiles, three per side, mounting booms, launchers, sight, control stick, and electronic equipment.

The booms are lightweight, turbular arms for carrying and launching the missiles. In an emergency, the pilot can jettison the booms and the attached missiles, or the gunner can jettison all launchers and missiles, either simultaneously or individually, without drooping the booms.

The rail-type launchers are connected to the boom by electrically-activated explosive bolts. The front end of the launcher is elevated so the missile will take a 5° up trajectory until it can be acquired and taken under control by the gunner.

There are two sights in the helicopter: One for the pilot so that he can align the helicopter within 8° (4° L or R) of the target; and one for the missile gunner.

The M58 sight is a six-power, gyro-stabilized, monocular sight. This sight allows the gunner to guide the missile to point targets up to 3500 meters in range with high probability of a first-round hit.

The gunner uses the control stick to guide the missile during its flight in much the same manner as a remote-controlled model airplane is guided. Considerable training is required for the gunner to develop the proper eye-hand coordination necessary to prevent overcontrolling the missile with this control stick.

The electronic equipment consists of two control boxes and the necessary wiring. The missile selection box permits the gunner to select any one of the six missiles for firing or jettison, guidance-wire jettison, or total jettison which blows all launchers and missiles. The control box contains the electronic signal encoder, which converts the control stick position commands to missile guidance signals, and the missile ignition and firing sequence controls.

The M22 subsystem is currently being used in Vietnam against bunkers; fortified positions, and tanks with a great deal of success. With the advent of the AH-56A Cheyenne, this subsystem will be replaced with the American-made TOW missile system.

The pilot normally fires the rockets, using the XM60 reflex infinity sight for aiming. Since the rocket launchers are in a fixed position, the aircraft must be on a target collision course for a successful engagement. The rockets are fired by selecting "Rockets" on the armament control panel and depressing the firing switch on the cyclic control stick.

The weight of the M16 armament subsystem is 1294 pounds fully combat loaded (with 10-pound warheads).

DOOR GUNNER

The helicopter door gunner may be the most underrated crewmember of the team. Seated in the open cargo door, he has an unrestricted view of everything on his side of the helicopter. Since he is not concerned with the actual control of the helicopter, he can devot full-time to searching for targets. As a result, this man is credited by some as acquiring and killing fifty percent of those attributed to helicopter fire support.

His duties as door gunner are secondary. On the ground he is either the crew chief responsible for performing first and second echelon maintenance on the aircraft; or the armorer, responsible for maintaining the weapons subsystem. However, once the aircraft is airborne on a mission, he goes along as door gunner. This makes for long hours and requires the man to be a highly motivated, responsible individual.

Let's briefly go over the equipment this man is wearing.

Starting at the top is the APH-5 flight helmet. This is the same helmet as is worn by the pilot. It allows the door gunner to communicate with the rest of the crew. Normally, he will not transmit outside his aircraft, but he can hear incoming transmissions and stay abreast of the entire situation. The APH-5 is not a ballistic helmet; however, units in Vietnam are being issued the APH-1, which is an antifragmentation helmet. Notice the gunner has a clear visor for protection against shrapnel. Being clear, he can use it both day and night. The door gunner is armed with the M60 machinegun. The gun may be a free gun, bungee mounted (as it is here), or pintle mounted as you will see later. The gun fires at 550 shots per minute and, in this system, normally has about 1000 rounds on board.

For protection, the door gunner wears a flack jacket, which stops shapnel, over a ceramic chest protector. The chest protector will stop 0.30 caliber armor piercing rounds, and, in some instances, even 0.50 caliber rounds. The carrier for the chest plate also has provisions for a back plate; however, because of weight (13 pounds), the gunner normally prefers to sit on the back plate rather than wear it.

The next item of equipment is the groin protector. This item is designed to protect vital parts from shapnel.

The leg armor is made of the same type ceramic material as the chest protector. Because of the weight and the fact that it hinders movement, leg armor is normally not worn by combat crews.

In addition to the armor protection, the gunner wears flight gloves and fatigues, with sleeves rolled down, for fire protection. Two-piece fireproof "NOMEX" flight suits are currently being issued to aviation crews in Vietnam, and are scheduled to be issued in CONUS soon.

2H98 RELATIVE WIND SENSOR

The purpose of the relative wind sensor is to provide a positive visual indication to the student and instructor pilot of the exact direction of relative airflow over the helicopter. The system has the capability to sense and display relative wind misaligned on two axes, up-down and/or left-right. Misalignment of 1½° and 3° or more is visually displayed. The visual displays for student and instructor pilot are similar. The student display is located within the XM60 sight reticle. It consists of nine small lights. Eight of these lights are located on the horizontal and vertical axes about the sight pipper. Two lights linearly up, down, left and right will show the student relative wind misalignment. The light left but close to the pipper together with the first indicates 3° or more relative wind from the left. The same is true for the other quadrants, right, up and down. The ninth light is located in the 4 o'clock position to the pipper and is green. This light lights to show perfect relative wind alignment. The lights in the sight reticle are not visible unless they are lighted. The instructor display is the same except that the lights are mounted on a small box designed for that purpose.

Signal Conditioning Unit - The signal conditioning unit consists of a box containing two pressure transducers, an electronic amplifier and four cable receptacles. The box is mounted on the bulkhead forward of the co-pilot anti-torque pedals.

The SCU also has an inhibitor switch (three amp capacity relay) that can be connected to the trigger wiring for the weapons. When the relative wind is properly aligned, the relay is closed; therefore, the trigger circuit is complete. When the relative wind is misaligned, the relay is open and the trigger circuit is interrupted and weapons will not fire. An override switch for this inhibitor is located on the avionics panel. The purpose of the override switch on the avionics panel is to allow the instructor to remove relative wind control from all firing, as desired.

Relative Wind Probe - The relative wind probe is a two-inch sphere mounted on a twelve-inch arm which is located adjacent to the UH-1B pitot tube. The sphere or probe has four ports, two on the vertical axis and two on the horizontal axis. Each port is directly connected to the signal conditioning unit. The difference in air-pressure on two ports vertically or horizontally is relative wind misalignment. This difference in air pressure is sensed by the transducers, which convert it into electrical current for the lights.

The relative wind sensor is primarily used to train students to fire 2.75" FFAR. 7.62mm or cal .50 can be used as sub-caliber for rockets. The relative wind sensor allows for a common ballistic trajectory that occurs when relative wind is properly aligned. Bullets will simulate rocket trajectory when the green light on the relative wind sensor is ON.

The relative wind sensor will display where rockets will impact in relation to the sight pipper. If lights in any direction are on, the rocket will impact in the direction of lights from the pipper.

The relative wind sensor will tell the pilot how to correct relative wind to insure rockets impact as desired. If left lights are on, step on the left pedal. Right lights, right pedal. If upper lights are on, decrease collective or lower lights, increase collective.

FIREFLY

This illuminating system is a fine example of field expediency and imagination in that it was originally designed and developed in Vietnam. Nicknamed "Firefly", it has been used very successfully in Vietnam to illuminate boats or sampans discovered operating in unauthorized areas at night.

The system is normally employed with two additional attack helicopters which will destroy those targets which are being illuminated. This concept has been used to sink hundreds of enemy boats and to kill untold numbers of Viet Cong on the large rivers and canals in Vietnam. Because of "Firefly", the enemy no longer enjoys the cover of darkness to hide his movements.

The light that is displayed here was locally fabricated by Page Aircraft Maintenance. This "Firefly" is patterned after the original device; however, certain improvements have been made. Instead of using the C-123 landing light, the H-19 landing light is used; and the addition of handlebars greatly improve the operator's ability to control the system.

The system has an intensity of approximately 1.5 million candlepower and operates from the aircraft 28 volt DC power supply. At an altitude of 1200 feet, the system can be used as a spotlight to illuminate an area 400 meters in diameter. At an altitude of 2,000 feet, the system, used as a flood light, can illuminate an area approximately 1,000 meters in diameter. The operator can elevate, depress, and traverse (demonstrate) the system using the handlebar controls. He can adjust the lights to be used either as a spot or flood light by turning this crank (demonstrate), which changes the focus of the beam.

Although this system is mounted on this particular aircraft, it is important to note that it can be mounted on any UH-1 aircraft in approximately three minutes.

In using a device of this kind the common question arises concerning exposure to enemy ground fire. Since its conception, none of the aircraft employing "Firefly" have been shot down. Due to the single light source and its intensity, range estimation and target lead are very difficult; in addition, the simultaneous attack by the "killer team" assists in neutralizing any ground fire.

The weight of the system is 46 pounds, and the cost per system is approximately $750.00 or less.

M16

The M16 subsystem has been the "work-horse" in Vietnam up to this time, but is gradually being replaced by the M21 subsystem which you will see in a few minutes.

The M16 helicopter armament subsystem has the dual capability of firing both machinguns and rockets. This capability gives the armed helicopter commander the advantage of selecting the weapon which is best suited for the target he is attacking. The system consists of four M60C machineguns and two 2.75" rocket launchers.

The flexible gun mounts allow the machineguns to be positioned as directed by the gunner/copilot. The guns can be elevated 15°, depressed 60°, traversed outboard 70° and inboard 12°. A fire interruptor switch prevents the guns from firing when they reach the 12° inboard limit.

The M60C machinegun is basically the same as the ground-mounted weapon. However, certain components have been removed or replaced and a remote firing capability has been given the weapon by replacing the trigger assembly with an electrically activated trigger solenoid. The cyclic rate of fire for each gun is approximately 550 shots per minute and the system is 2200 shots per minute.

Two seven-tube rocket launchers are attached to bombshackles located inboard of each gun mount assembly. The launchers can be jettisoned in case of inflight emergency. The rockets are normally fired in single pairs - one rocket from each side of the aircraft; however, the pilot can select any number of pairs to be fired at one time. Also, single rockets can be fired by pre-setting the intervalometers (0 on one side and 13 on the other).

The cargo compartment contains twelve ammunition boxes. The total capacity of the ammunition boxes is 600 rounds. The flexible chuting contains an additional 700 rounds making a total of 6700 rounds of 7.62mm ammunition.

The primary means of firing the machineguns is with the gunner/copilot's flexible sight. The sight is a space parrallelogram that allows the gunner to sight around obstacles within the cockpit without disturbing his plane of reference. In order to direct or fire the machineguns from this sighting station, the gunner must depress the action switch.

The secondary means of firing the machineguns is in the stowed position. In this mode, the guns are aligned with the aircraft, and a target collision course must be flown. The guns are fired with the firing switch located on either cyclic control stick.

The primary means of firing the guns is with the gunner's flexible sighting station, which is a space parallelogram, allowing the gunner to sight around obstacles within the cockpit. A secondary means of firing the system is in the stowed position using the firing switch on the cyclic control stick.

Experience has shown that this system is more reliable than the M16 primarily because 50 percent of the flexible chuting has been eliminated. Future improvements in munitions will improve the capabilities of this subsystem which is already considered our most versatile UH-1 subsystem.

M21

The M21 armament subsystem evolved from and is destined to replace the M16 subsystem, which has been the primary helicopter armament to date. It inherited all of the advantages and capabilities of the M16; however, in most areas, the capabilities have been improved

The primary difference between the M16 and M21 is the machineguns. The four M60C machineguns, which were basically infantry weapons modified to be used on the M16, have been replaced by two M134 7.62mm high-rate-of-fire automatic guns. The substitution of the automatic guns for the M60 machineguns has more than doubled the system firepower. The M21 has a maximum cyclic rate of fire of 4,800 shots per minute; 2,400 shots per minute per gun. The maximum rate of fire is constant if both guns are selected. However, should either gun reach a 12-degree inboard limit, it will cease to fire; and the opposite gun will then accelerate from 2,400 to 4,000 shots per minute. The gunner also has the capability of selecting either gun to obtain a minimum rate of fire of 2,400 shots per minute. A three-second burst limiter prevents him from firing bursts longer than three seconds; this prolongs gun life and prevents unnecessary expenditure of ammunition.

The M134 automatic gun is an electrically driven, air cooled, six barreled, high-rate-of-fire automatic gun. The elctric drive motor rotates the gun in its housing by means of gears. Attached to the right side of the gun is the delinking feeder which accepts linked ammunition, strips the rounds from the links, ejects the links, and feeds the rounds into the chambers. An important safety feature is that the automatic guns are completely cleared after each firing burst. Any time a weapon ceases to fire, a minimum of six live rounds are dumped overboard. A change is being processed to add a declutching-delinking feeder to eliminate this problem.

The ammunition storage boxes are basically the same as that used in the M16. The capacity of the boxes is 6,000 rounds and the flexible chuting contains an additional 200 rounds. An electrically driven crossover cartridge drive has been attached to the boxes and allows the ammunition to be pulled from the primary row initially and then, by means of a clutch mechanism, from the secondary row.

The flexible gun mounts allow the guns to be positioned within the flexible limits of 10° up, 85° down, 70° outboard, and 12° inboard.

The bomb racks located inboard of the gun mount assemblies support the rocket launchers. The launchers can be jettisoned in case of inflight emergency or combat damage.

XM3

This armament system is an area weapon which is currently being used in the aerial artillery battalions. A launcher pod containing 24 rocket tubes is mounted to the universal mount on each side of the helicopter. These pods can be jettisoned in case of inflight emergency by applying voltage to two explosive bolts on each launcher. This subsystem weighs 1,441 pounds with its standard load of ammunition (48 rockets w/10-pound warheads). The subsystem is capable of selective fire in the following modes: pairs (single rocket from each pod), or multiple pairs of 2, 3, 4, 6, or 24 pairs (48 rockets), with a rate of fire of 6 pairs per second.

The 2.75" folding fin aerial rocket is used in this subsystem. The maximum effective range of the 2.75" rocket is 2500 meters, and the minimum employable range for safety reasons is 300 meters. The greatest accuracy can be achieved at ranges between 300-1750 meters.

The 2.75" rocket was originally designed to be fired from high speed aircraft (in excess of 200 MPH). Since the helicopter airspeeds are considerably slower, it becomes necessary to modify the rocket for greatest accuracy. The thrust nozzles on the fin assembly have been cut at a 24° angle which imparts a 15-22 RPS spin. This spin helps to stabilize the rocket. Next, the rocket is retained in the tube until its thrust exceeds 100 pounds provided the shear pins are used; however, to expedit reloading, the shear pins may be left out with only a slight loss of accuracy from lower launch velocities.

The pilot uses the MK8 infinity sight to aim the rockets. The sight is normally harmonized with the burst of the rockets at a range of 1250 meters which is the midrange point of the rocket. The pilot then uses this "combat sight setting" by holding over on targets at greater ranges and under on targets at ranges less than 1250 meters. In order to aim the rockets, the pilot must fly a target collision course changing the attitude of the helicopter for elevation adjustments.

The rockets are fired by depressing the firing switch on the cyclic control stick and may be fired by either the pilot or copilot.

The rocket armament panel provides the pilot with a jettison switch, a rounds counter, a SAFE-ARMED switch, and a pairs selector switch. The pilot can determine the condition of the subsystem by a glance at the lighted indicators on the rocket armament panel.

Some limitations of the system are (1) Unable to fire single rockets unless some tubes are left empty, and (2) unable to fire mixed loads of 6, 10, and 17 lb warheads. This last limitation will be overcome with the development of ballistically matched warheads of various munitions.

This subsystem is in limited production and will be phased out as Cobras are placed in the Aerial Rocket Artillery battalions.

M5

The M5 helicopter armament subsystem fires a 40mm grenade projectile as a direct-fire, area weapon.

The M-75 grenade launcher is mounted inside this 98-pound turret attached to the nose of the helicopter. The turret allows the gunner to position the launcher within the flexible limits of 15° up, 35° down and 60° left and right of the helicopter center line. The turret can be removed easily by removing the retaining pins at the three mounting points. The top and front enclosures are easily removable to permit access to the launcher.

The M-75 grenade launcher is a very rugged and dependable weapon. It is electrically operated, percussion fired, and metallic link belt fed. The launcher will fire 220 shots per minute and has a maximum employable range of 1750 meters. Maximum effective range is 1200 meters.

A booster drive motor located within the electronic compartment assists in pulling the ammunition through the flexible chuting to the launcher. This motor is activated by the trigger switch.

The flexible chuting contains 75 rounds of 40mm ammunition. The ammunition box is constructed of steel and is held in place by a toe plate and nylon tiedown straps. It contains an additional 75 rounds, making a total of 150 rounds for the system. A recent MWO to this system increases the total capacity to 300 rounds.

The 40mm grenade projectile has a bursting radius of ten meters and a muzzle velocity of 70 feet per second.

The primary means of firing the system is with the gunner's flexible sight. The sight is retained over the gunner's head by two stow locks. When these locks are released, the sight is lowered on two telescoping arms. These telescoping arms are attached to an azimuth ring which permits the gunner to sight at targets left and right of the center line. Once the turret control switch on the control handle is depressed, the turret will follow the movements of the sight within its flexible limits. The trigger switch is located immediately above the switch on the control handle.

A secondary means of firing the system is in the stowed mode. In this mode, the launcher is aligned with the center line of the helicopter. Either the pilot or the copilot/gunner can fire the system in the stowed mode by depressing the firing switch on either cyclic control stick.

During the conduct of stow fire, the pilot can control the launcher elevation by using the elevation control wheel on the turret control panel.

The total weight of the M5 armament subsystem is 335 pounds combat loaded with 150 rounds. Improvements on the system include an ammunition box which will increase the system capacity to 300 rounds, an automatic lead compensation which will greatly increase gunner accuracy, and, for the future, higher velocity rounds with a wide array of available warheads.

The system has proved highly effective against personnel and soft material targets. The slow muzzle velocity of this system has drawbacks ballistically but has proved highly successful in placing suppressive fires during target disengagement. As the aircraft is breaking from the target run and exposing its underside, the last rounds fired are just starting to explode.

DOOR MOUNTED HELICOPTER ARMAMENT (BUNGEE - M-23 - M-24)

The first machine gun system to be used by the door gunner or crew chief was a regular M60C machinegun. The weapon was hand-held (so called "free" gun) and was completely flexible. Because of excess weight, units in Vietnam soon began removing the bipods and sights from the weapons.

The next type of door gun consists of an M60 machinegun held in place by a bungee cord (a cloth-covered elastic cord) and utilizing a box on the floor of the cargo compartment to hold approximately 1000 rounds of linked 7.62mm ammunition. To overcome problems of twisted belts, ingenious crew members devised a method of attaching a C-ration can to the gun so that the belt would feed smoothly. This system is completely flexible and permits the gunner to traverse without any restrictions. This has resulted in the gunner inadvertently shooting through his aircraft's rotor system, door posts, skids and armament system.

In spite of these limitations, both the "free" gun and the bungee-mounted gun are so effective that many units in Vietnam continue to use them. The C-ration can, however, will soon be replaced by a feed-guide which is now under extensive research and development.

The M23 system was designed to replace both the bungee-mounted guns and the "free" guns, but is currently used only on D model troop carriers. The M23 system consists of two M60D machine guns, with spade grips and ring sights, pintle mounted to the left and right cargo doors. The system consists of the gun, the mount, an ammunition box, ammunition chute and brass-catching bag. Mechanical safeties and stops prevent damage to the helicopter by inadvertent firing of the machineguns. The rate of fire is approximately 550 shots per minute from each gun. The ammunition box holds 200 rounds of linked 7.62mm ammunition.

The M24 system is similar to the M23, but is designed for use on CH-47 helicopters. The difference between the systems is in the mount assemblies.

LIGHT OBSERVATION HELICOPTER

OH-6A CAYUSE

The OH-6A Cayuse is the winning Hughes Tool Company entry in the Army's design competition for a light observation helicopter. This design incorporates several major advances in helicopter technology.

The main rotor system is a four-bladed, fully articulated design which gives the aircraft very smooth, highly controllable flight characteristics, even up to 121 knots. Each blade is a lightweight, aluminum envelop folded over a spar in the leading edge. Each blade is attached to the hub by two quick disconnect pins and can be removed and carried by two men.

The basic structure of the helicopter is an "A-Frame" with the transmission mounted at the apex of the "A". This gives the helicopter extremely high structural rigidity and crash survivability.

The power plant for this helicopter is the Allison T63A5A. This 134 pound turbine engine develops over 300 shaft horsepower. Due to its light weight, two men can replace the engine in 30 minutes.

The primary missions for which this helicopter is used are reconnaissance and surveillance. It can also perform artillery adjustments, command/control, and other missions on a limited basis.

The helicopter is limited to 2400 pounds maximum operating weight and will fly for approximately 03+30 hours on one fuel load. Maximum cruise airspeed is 120 knots. Maximum personnel load is 5 troops.

XM-27

The XM-27 subsystem, consisting of the M134 automatic gun, mount assembly, ammunition boxes, XM70 sight and fire control system, is designed for use on the OH-6A Cayuse and the OH-58 Jet Ranger to give them more versatility on reconnaissance and security missions.

The gun has a dual rate of fire capability of either 2,000 or 4,000 shots per minute. This is controlled by using the first or second detent on the cyclic firing switch.

The mount assembly, which attaches to the floor of the cargo/passenger compartment, carries the ammo boxes and supports the gun allowing it to elevate and depress from +10° to -24°. Elevation-depression is controlled by the E-D switch on the cyclic.

The XM-27 has a dual capability to either fire-to-clear or fire-normal. The first allows the weapon to fire all rounds in the chamber after the trigger is released. Fire-normal mode leaves rounds in some chambers and there is no delay when firing is resumed.

Fully loaded, the system holds 2,000 rounds of 7.62mm and weighs 276 lbs. A switch in the ammo tray cover activates an "Ammo - Lo" light on the console to notify the pilot when 200 rounds are remaining.

In conjunction with the XM-70 sight, the system has a maximum effective range of 1,000 meters. The fairing covering the gun provides for streamlining and airflow around the weapon for cooling.

The system is limited in that it is fixed forward requiring the pilot to fly a target collision course in order to fire and that, with the weapon system installed, carrying of passengers is prohibited. The XM27E1, which will replace the current model, will allow one seat in the passenger compartment to be utilized.

PRESENTATION BY DEPUTY CHIEF OF STAFF FOR LOGISTICS

PROGRAMMED CHANGES TO ARMY AIRCRAFT MAINTENANCE SYSTEM RESULTING IN THE TAILORED INSPECTION MAINTENANCE SYSTEM

Early in 1964, certain areas and conditions were recognized as being inadequate to support the mission requirements of the school flying hour program. One major program that led to reevaluation of the current standard Army maintenance system was the inability of the T53-L-1A engine to meet its established TBO due to internal engine failures, resulting in forced landings and general unreliability to meet school requirements. In mid 1964, a trip to ARADMAC at Corpus Christi, Texas, was undertaken to discuss the engine problems that were adversely affecting UH-1 availability and reliability. At this time all UH-1A's in the Army inventory was being assigned to Fort Rucker and this meeting was to coordinate efforts to accomplish all overhaul requirements at the overhaul activity, accomplish the maximum field maintenance repairs equipment would permit and establish the priority for closed circuit turn around of parts and equipment peculiar to ARADMAC/Fort Rucker only.

Shortly after this coordination, an Army/Industry Helicopter Safety/Reliability conference was held to specifically deal with problems being encountered between the user and industry. A series of meetings, conferences, discussions and programs resulted to work on specific areas that, by experience, were necessary to meet the increasing needs of the pilot training program.

Volumes of statistical data were gathered to support requests for engineering assistance, overhaul requirements to better meet the needs of using activities, and better supply support. Special studies and programs were conducted in many cases to provide the necessary data, i.e., T53 engine vibration testing, to determine overhaul, maintenance, and inspection needs.

In early 1965, logistical data revealed that these efforts had showed the following improvements:

- 7% increase in availability
- 5% reduction in NORS
- 2% reduction in NORM

However, this did not indicate that availability rates would support the school needs.

In mid 1965, a study of various types maintenance systems was made in an effort to determine the most suitable system to support the Army Aviation School and Center fleet requirements. Systems studied were:

1. Current Army Maintenance System
2. Progressive Maintenance System
3. Airline Maintenance System
4. Air Mobility Maintenance Concept
5. Production Line Maintenance System

Of all these systems, the current Army Maintenance System was the best adapted, providing - some regulations and restrictions be changed to permit greater flexibility in the system to satisfy local school requirements. Note that all the efforts undertaken are to increase the availability here at Fort Rucker due to its unique type operation.

A review of what might be termed wasted maintenance manhours was even made - this being in the lateral transfer of parts in short supply to keep availability as high as possible. For example, in a one month period, over 550 lateral transfer of parts was experienced on just one type aircraft - the UH-1. When we say wasted effort, it takes three times as much maintenance to make a lateral transfer of just one part, twice to make two installations and maintenance time lost in other maintenance while double time is expended in transfer, adjustment and possibly test flight to complete installation.

In August 1965, an Ad Hoc Committee formed by DA was briefed on policies contributing to aircraft maintenance performance improvement. Herein, it was suggested that the committee consider a concept that would modernize the current scheduled maintenance intervals and provide immediate improvement in aircraft availability with significant manpower and cost savings. This could be accomplished by:

1. Require a policy decision to deviate from established Army Regulations.
2. Develop a specific general aircraft maintenance support procedure for an overall maintenance effort.
3. Develop a detailed maintenance support procedure for each type of aircraft, based on experience, utilization, safety, quality, performance and cost.

During all this time the Ad Hoc Committee was busy looking into every major problem. Results were not immediate due to the fact that many were interrelated. However, higher echelons were brought into the picture to add the necessary emphasis required on such a large project.

In October 1965, the Ad Hoc Committee, based on all studies of the problems discussed, decided that the Progressive Maintenance System would best provide the higher availability requirements.

A Progressive Maintenance Concept was devised and on 15 November 1965, the PMC was begun on a test basis on a selected fleet of twenty UH-1 aircraft.

Much mention has been made to the Ad Hoc Committee and some identification of who makes up this committee is probably in order. As we see by the first chart, it is made up of:

Department of the Army
Aviation Materiel Command
Army Materiel Command
Army Maintenance Board
Third U.S. Army
U.S. Army Aviation School and Center

As we have mentioned, the committee spent many hours studying the maintenance system and procedures used at Fort Rucker which were based on current Army Regulations, Directives and Technical Manuals. Of particular importance to the committee were the clock hours of down-time required to accomplish 100-hour grounded periodic inspections on UH-1 aircraft and the interference of the scheduled maintenance down-time with the flight schedules. It was decided that the objectives of the committee study should be:

1. Increased aircraft availability
2. Reduced number of aircraft required for the mission

It was recognized by the Ad Hoc Committee that existing systems, regulations and procedures may require changes or revisions to relieve restrictions affecting aircraft availability and that the new concepts should be developed. If the concepts were acceptable and implementation of the concepts would be in conflict with regulations, directives, etc., those regulations, directives, etc. would be changed.

Ad Hoc accomplishments in 1965 - 1966 were made through emphasis placed on the supply system by all commands to reduce the NORS rates and develop long range procurement plans for the increased flight hour training program at the Aviation School.

Maintenance test flights were previously limited to official daylight hours. During winter months, the daylight hours coincided with daily flight schedules; therefore, aircraft requiring test flights could not be released for flight prior to the time aircraft were needed to

satisfy flight missions. TB AVN 23-16 was changed to authorize night test flights with certain restrictions to preclude unsafe practices.

A study was made to determine the requirements to decrease the clock hour downtime and manhours required to change major components on rotary wing aircraft. There was no question that QCA's were needed. By having the major components assembled and ready for installation on the aircraft when components are due change could result in reducing maintenance interference with flight schedules.

Scheduled maintenance interference with flight schedules reduced.

Progressive maintenance concept developed and tested.

Scheduled maintenance must be performed when aircraft are not needed for flight missions. In other words, the work should be done at night and on weekends at the Aviation School as most training flights are accomplished during daylight hours. The allowable time for maintenance, therefore, is after completion of the flight training day and until the AM flight period the next day.

The year around average flight training day at Fort Rucker is appromimately 13.5 hours long.

The average allowable clock hour downtime for maintenance is 10.5 hours.

Under the standard Army Maintenance System approximately 72 clock hours are required to complete the 100-hour periodic inspection and maintenance on the UH-1 aircraft, after the PE becomes due. As a result of the downtime required for scheduled maintenance (periodic) flight schedule, interference involves three training days every 45 days.

To reduce flight mission interference by performing the scheduled maintenance (100-hour periodics) at night required separating the 100-hour inspection requirements into intervals that could be accomplished in the allowable downtime for inspection and maintenance.

It is important to remember that emphasis was placed on the periodic inspection portion of the existing maintenance system as there was no need to change the daily inspection and intermediate inspection requirements which are a part of the existing maintenance system. They have been accomplished well within the allowable downtime for maintenance at the Aviation School. The periodic inspection was divided into four phases to be accomplished at 25-hour intervals.

After command approval of the plan of test developed at Fort Rucker for the Progressive Maintenance System, the test commenced 15 November 1965 at Lowe Field with 20 UH-1 aircraft involved.

Detailed records of clock hour downtime and manhours required for each phase of inspection and maintenance were maintained on the test aircraft for comparison of similar data on the remaining UH-1 fleet.

Periodic evaluation of the test data was made by the Ad Hoc Committee. The test results were encouraging and revealed areas requiring changes to phases of inspection to improve the turn-around time.

It was decided that the test would be concluded as of 10 July 1966 as sufficient data and experience had been obtained to determine the advantages and disadvantages of the concept.

At test conclusion 50 aircraft were in the system.
Approximately 15,000 hours had been flown.
555 phase inspections had been performed.
Three revisions had been made to improve the concept and were implemented during the test.

As previously stated, the daily and intermediate inspections do not interfere with flight schedules, therefore, the advantages and disadvantages we will discuss are primarily the result of the four phases of inspection as compared to the 100-hour grounded periodic.

Advantages:

3% increase in availability as of 0630 hours daily. This is the time aircraft availability reports are compiled.

3% reduction in aircraft inventory requirements. (If 450 aircraft assigned - this would be a savings of 14 aircraft - over $3.5.)

75% faster recoverability from scheduled maintenance backlogs. (One-fourth the time required for grounded PE's as only one-fourth of the PE is accomplished at one downtime.)

36% less clock hour interference with flight schedules. (Grounded PE's overlap flight schedules 12 hours on three successive days, whereas Progressive Maintenance Concept overlapped only 23 hours during 100 hours of flying.)

Disadvantages:

Scheduled maintenance fluctuates more proportionately with daily flight utilization. (Assuming that 1200 flight hours is the daily program at a particular field location, if the program were adhered to, twelve 100-hour periodics would become due.) A 200-hour overfly of the program, which is not uncommon would cause two unprogrammed

100-hour periodics to become due, whereas in PMC eight unprogrammed phase inspections would become due. If sufficient manpower weren't available to perform the unprogrammed maintenance, availability the next AM following the overfly would be reduced four times more under PMS than the 100-hour periodic.

Flight and maintenance scheduling is four times more difficult to control under PMS in that the aircraft must be scheduled into maintenance (hangar crews) four times during 100 flying hours as compared to one time for the 100-hour periodic.

25-hour phase intervals interfere with special mission completions such as tactical field exercises when aircraft remain in the field. The flight hours are not adequate to continue missions without replacing the aircraft before mission completion.

Covered maintenance facilities are required for each phase inspection interval. Therefore, the hangars are used at three additional flight intervals during 100 flight hours - an increase of 75% hangar utilization.

At the July 1966 meeting of the Ad Hoc Committee it was decided that the PMS was adaptable to fleet operations at the Army Aviation School and had a potential of being adapted to Army aviation units in the field. To make PMS more effective, revision number 4 was developed to:

Overcome or reduce the disadvantages experienced during the test of the concept.

If the disadvantages could be overcome or reduced, aircraft availability would be increased.

Other considerations during development of revision 4 were:

Change the inspection requirements to intervals that would produce a more reliable aircraft (less unscheduled maintenance during the flight day).

Reduce the maintenance manhour requirements (if possible), thereby reduce cost of maintenance.

Design the system to enable more personalized attention to the user and equipment.

During the past 25 years, Army aircraft have progressed from the L-1 light aircraft to such complex aircraft as the CH-47. As the complexity of the aircraft increased, the maintenance requirements increased - causing a need for more skilled maintenance manhours and more clock

hours of downtime for maintenance. As the downtime for maintenance increased, so did the number of aircraft in the inventory to satisfy mission requirements.

Although the inspection and maintenance requirements for each type aircraft have been revised and improved over the years, the requirements are still based on a standard inspection and maintenance system applicable to all types of Army aircraft. Application of the existing standard inspection and maintenance system on all types of aircraft in the current inventory indicates that some aircraft are being over maintained while others may be under maintained.

The inspection and maintenance system should be tailored to the type of equipment and its requirements.

Earlier in our discussion of the existing mainteance system, it was stated that the daily and intermediate inspections were accomplished well within the allowable downtime for maintenance. If time is available in excess of allowable downtime for the daily and intermediate inspection, why not perform more inspection and maintenance at this time and eliminate these same requirements at some higher inspection interval. This is basically what was done to develop revision number 4.

The existing daily inspection requirements are and have been considered adequate to determine airworthiness and safety of flight conditions each day the aircraft flies. If the scope and thoroughness of the daily inspection is increased, the flight safety factors should also increase.

As a result of increasing the scope and thoroughness of the daily inspection - conditions will be found that will require more maintenance and repairs than required by the existing system. By correcting the deficiencies on a daily basis, two things will be accomplished:

1. The aircraft should be more reliable to accomplish the next days flight mission.
2. The maintenance and repair requirements at a higher inspection interval will be reduced.

The TBO items to be replaced at specified flight hours will continue to be changed when due. (By not changing the TBO item schedules, which are the significant safety of flight components, the changes in the inspection intervals pertain to the airframe, a portion of the flight control system, fuel system, etc.)

The new inspection and servicing intervals for UH-1, OH-13, TH-13T helicopters are now: Daily, 50-hour, 100-hour, 300-hour, and are cycled on a basis of 300 flight hours rather than 100 hours and includes servicing requirements previously accomplished throughout 1000 flight hours.

The new inspection and servicing intervals for O-1, OV-1, U-6, U-8, T-41 and T-42 fixed wing aircraft are now: Daily, 50-hour, 300-hour, and are cycled on a basis of 300 flight hours rather than 100 hours and include servicing requirements previously accomplished throughout 1000 flight hours.

The new inspection and servicing intervals for CH-34 are: Daily, 50-hour, 200-hour, and are cycled on 200 flight hours rather than 100 hours. Servicing requirements remain the same except for M/R head which will be lubricated on a daily basis (25, 50, 100 previously).

The extent of inspection and servicing requirements to be accomplished at a specific interval was given these considerations.

1. Safety of flight condition if system or component malfunctioned or failed. (This factor influenced more frequent inspection of critical items than the existing system requires.)
2. Multiple safety indicators of system malfunctions or impending failures available to pilot and maintenance personnel.
3. Special one-time inspections over and above scheduled inspections and servicing intervals, i.e., hard landing inspection, over temperature conditions, component system malfunctioning trends requiring fleet inspection, oil samples, etc.
4. Frequency and need for mandatory test flight.
5. The amount of downtime allowable to accomplish the required inspection and maintenance at each inspection interval.

From the changes made to the standard Army Aircraft Maintenance System and the maintenance crew structure, here are the changes we were striving for:

Improved aircraft safety.
Improved equipment reliability.
Improved aircraft availability.
Improved control of flight and maintenance scheduling.
Improved coordination between aircraft user and maintenance support personnel.
A maintenance system tailored to equipment requirements.

After the fourth revision of the PMS was studied by the Ad Hoc committee and other interested agencies, i.e., UH-1 Project Engineers, USABAAR, Center Safety, Pilots, maintenance personnel. Other technically qualified personnel approved the system. The Commanding General, Fort Rucker, approved the system and the Department of the Army authorized its implementation. Actual implementation took place 12 September 1966 at Lowe Field with approximately 250 UH-1 aircraft.

We had estimated 60 days for a complete conversion - actual time was less than 30 days.

On 25 October, the remainder of the UH-1 fleet located at Hanchey Field was included into TIMS and on 5 December, the O-1, OH/TH-13's and T-42's were added to TIMS fleet. The T-41 was included on 9 January 1967; U-6A in March 1967; and CH-34 in April 1967.

The most significant advantages expected and experienced from the new system to date are:

Management control of flight and maintenance scheduling: Assuming that 250 aircraft were maintained under the previous PMS at a particular field location - flight and maintenance scheduling involves 1000 phases of inspection which have to be monitored and controlled daily. Between 36 and 40 aircraft by tail number would require scheduling into maintenance daily; whereas the new PMS (TIMS) requires 18 to 20 daily - 50% improvement.

Scheduled inspection downtime interference with flight schedules: As previously discussed, scheduled maintenance interference with flight schedules has been reduced 57 hours from the previous PMS and 96 hours from the 100-hour periodic during 300 flight hours.

Availability increase: Each flight day the aircraft is available during a 21 flight day month is equivalent to approximately 5% availability. (We have experienced an increase of approximately 7% availability.) The amount of availability increase to be gained from fewer pilot turnbacks is not figured in percentage but has shown a definite improvement. Replacement of aircraft to tactical field exercises has been virtually eliminated by reassignment of test pilot to provide coverage at TAC areas.

Covered maintenance facilities: Will be used 25% less than standard Army system or progressive maintenance system.

Cost savings: Less facilities needed; less aircraft required; potential maintenance crew requirements.

As a result of the studies that have and are being made, it seems that revision number 4 to the Progressive Maintenance System has created a maintenance system that is more appropriately named TIMS - in that each type of aircraft has an inspection and maintenance system tailored to its specific requirements.

Statistical data shows a definite increased aircraft availability, reduced NORM rates and reduced NORS rates. Following table reflects latest available figures.

AIRCRAFT AVAILABILITY, NORM RATES AND NORS RATES

Information on average NORM rates, NORS rates, and aircraft availability rates as of 30 June 1968 are as follows:

		NORM RATE COMPARISON		NORS RATE COMPARISON			
Type Acft	Month Impl	Avg NORM Prior TIMS	Avg NORM for TIMS	Avg NORS Prior TIMS	Avg NORS Since TIMS	Avg Aval Since TIMS	Avg Chg in Acft Aval
UH-1	Oct 66	23.1%	15.9%	11.9%	11.1%*	73.0%	+8.1%*
TH-13	Dec 66	12.1	9.6*	7.2	7.6	82.8	+2.1*
OH-13	Dec 66	15.5	16.3	2.1	1.6*	82.0	-.4
CH-34	Apr 67	19.7	14.6*	9.6	13.4	72.0	+1.3*
O-1	Dec 66	19.6	15.6*	.7	.6	83.8	+4.1*
T-42	Dec 66	18.1	16.9*	1.0	1.5	81.6	+.7*
U-6	Mar 67	17.7	13.8*	.1	1.6	84.6	+2.4*
U-8	Jul 67	14.5	17.4	1.4	4.5	78.1	-1.2
OV-1	Jul 67	19.7	17.1*	9.3	11.8	71.1	.0
T-41	Under TIMS since arrival		8.2	NA	1.3	90.5	NA

*Improvements

PRESENTATION BY DEPARTMENT OF MAINTENANCE TRAINING

The mission of the Department of Maintenance Training is threefold: to train enlisted personnel as aircraft maintenance apprentices and repairmen to perform organizational, direct and general support maintenance; to train enlisted door gunner volunteers in selected UH-1 maintenance subjects; and to train aviators in the operation of aircraft systems. Our training effort is designed to fulfill the requirements in the field and specifically in Vietnam.

Our organization is reflected on the chart in figure 1. We presently have four instructional divisions: the Primary Maintenance Division trains the initial entry enlisted student and awards the 67A10 MOS, Aircraft Maintenance Apprentice.

The Utility Attack Division is concerned with the UH-1 helicopter training for the enlisted and officer maintenance courses. They produce the 67N20 MOS, UH-1 Helicopter Repairman. Additionally, this Division provides maintenance training of UH-1 helicopter systems to the initial entry rotary wing pilots, both officer students and warrant officer candidates. Presently, the instructors of this division provide instruction to approximately 400 student pilots per month.

The Cargo/Observation Division is concerned with the maintenance training of enlisted personnel leading to the award of the 67M20 MOS, OH-13/23 Helicopter Repairman. Additionally, this division provides maintenance instruction to aviators attending transition training in the OH-6A (Cayuse), CH-34 (Choctaw), CH-47 (Chinook), and CH-54 (Crane).

The Fixed Wing Division is concerned with both single engine and multi engine aircraft. Enlisted maintenance instruction is provided leading to MOS awards of 67B20, O-1/U-6 Airplane Repairman; and the 67H20, OV-1 Airplane Repairman. Additionally, maintenance instruction is given to aviators attending transition training in the aircraft just enumerated plus the T-41, T-42, and the U-21

The Instructional Support Division supports the four instructional divisions by providing aircraft maintenance support to 91 aircraft (21 F/W, 70 R/W), over 500 major training aids, and over 100 items of ground support equipment.

The Leadership Training Division and the Advanced Training Division will be established prior to January 1969 for implementation of the Skilled Development Base Program. These two divisions qualify selected MOS enlisted personnel for TO&E positions in grades E5/E6 so that they will

DEPARTMENT OF MAINTENANCE TRAINING

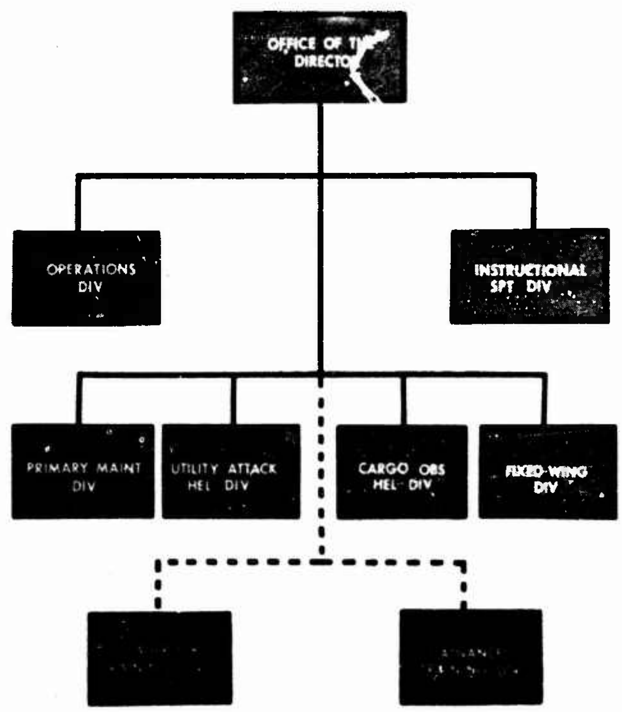


Figure 1

be capable of performing as seasoned leaders, supervisors, and technicians in the grade and MOS of their duty assignment.

The Operations Division is organized to handle the day-by-day administrative requirements associated with the training of the students. Their Projects Branch deals with present and proposed department projects and their Plans Branch develops long range plans for future endeavors and requirements of the department.

The two senior educational specialists in our Curriculum Engineering Branch work directly under the control of the department director. Their function is to design programs of instruction. They accomplish this by providing review, monitorship, guidance, and direction to committees composed of the department's best talent in a specific field.

The Administrative Branch is concerned with the administrative requirements of all assigned personnel, excluding personnel and pay records of individuals.

At the apex of the departmental structure is the director.

The typical student we receive from basic training centers has been in the service nine weeks and holds the rank of E-1. He is a high school graduate, single, and 19 years of age. He enlisted in the regular Army and will be selected for a follow-on course in one of the six 67 MOS awarding courses.

Our enlisted maintenance training is accomplished as depicted on the chart in figure 2. All students enter the Aircraft Maintenance Apprentice Course (AMAC). This course as shown on the chart is divided into two parts, Phase I and II. Approximately 55% of the students who enter Phase I are selected to enter a higher skill level 67 MOS series course. After completion of Phase I, they flow directly into one of the advanced courses.

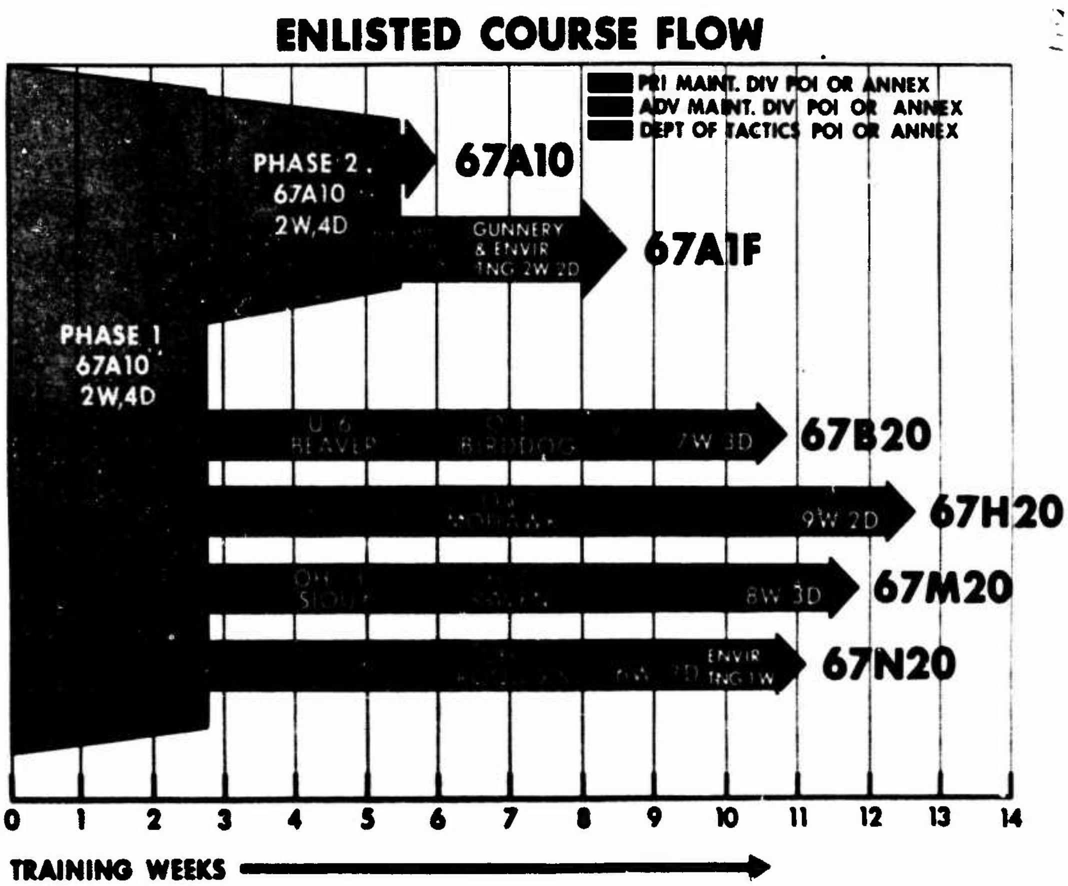


Figure 2

The remaining students complete Phase II and are awarded a 67A10 MOS which designates them as an Aircraft Maintenance Apprentice. Sixty percent of these 67A10 graduates go directly to the field. The remainder, who are door gunner volunteers, go directly into the Door Gunner Course which trains them on UH-1 maintenance, gunnery, and environmental subjects. After completion of this course, they are awarded a 67A1F MOS and go the the field specifically earmarked to fill the door gunner need in Vietnam. This course, which began on 5 July, is the first MOS awarding Door Gunner Course to be taught in the US Army. This course teaches the soldier subjects which enable him to assist the Huey Crewchief in maintaining the aircraft as well as perform his primary duty of door gunner on a Huey helicopter.

The students who enter the higher skill level 67 MOS series courses are awarded, upon completion of the particular course, the MOS corresponding to the type aircraft on which they have been trained. For example, the graduate of the OV-1 Airplane Repair Course is awarded a 67H20 MOS, OV-1 Airplane Repairman.

Beginning on 1 July 1968 all the higher skill level 67 MOS series courses incorporated the organizational, direct support, and general support maintenance training concept (or "user/support concept" as it is commonly called). This produces a graduate who can be assigned either to an aviation unit or to an aviation maintenance support unit. This new concept replaces the strictly organizational maintenance concept which had previously been taught. This change in concepts supports the most recent overhaul of the 67 MOS career field in AR 611-201. In simple terms, this graduate can be assigned as a repairman in any level of aviation maintenance.

The length of time required to produce a particular MOS graduate is shown on the chart in figure 2. For example, it takes a total of 12 weeks 2½ days to train an OV-1 Airplane Repairman.

Of the six main enlisted courses, two of them start a new class every day, and four start a new class weekly. The 67A10 apprentice and the 67N20 UH-1 repair course have the daily input. In figure 3 we see the daily flow charted for the 67N20 course, where one class is started and another graduated each day. Due to this flow, every subject is taught each day. Reading across the top of the chart, it will be noted that there are 30 training days in the course. Training days 9 through 28 have been omitted to enable enlargement of the chart. The days of the week are depicted on the left margin. By reading any column top to bottom, you will note that the same subjects are taught daily. To read the chart, pick a color. This represents a class. You can follow this class from start to finish by following the color diagonally through the chart. On the 5th training day you will note

67N20 DAILY FLOW (UH-I)

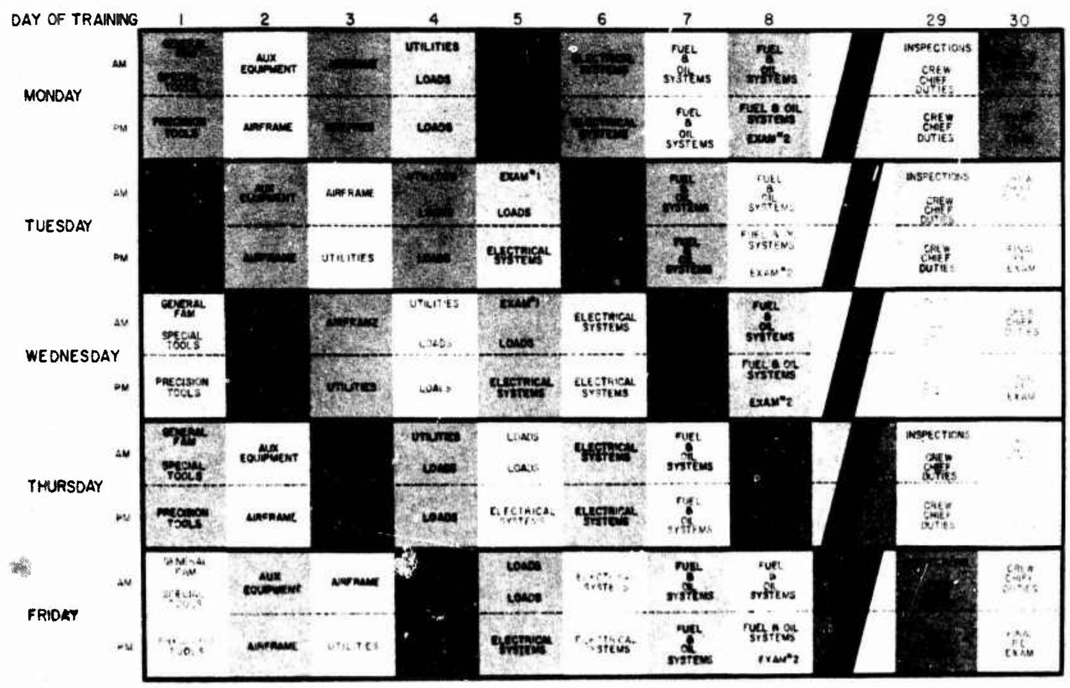


Figure 3

that an examination is given. If a man fails the examination, it can be determined from his answer sheet which subjects he is weak in. He can immediately reattend this instruction the next day from another class, then retake the exam. No time is lost waiting several days or weeks for a new class to start, since all subjects are taught every day. The expediency of this system allows us to salvage many academic borderline cases by immediate retraining. Therefore, our academic attrition rate is extremely low, usually less than 1 percent. This daily flow evolved when mobilization rates were needed to sustain Vietnam requirements for aviation mechanics. The daily flow has proved to be much more effective than solving the problem with a double shift. The daily input provides smaller classes and lends itself to a better student-to-instructor ratio.

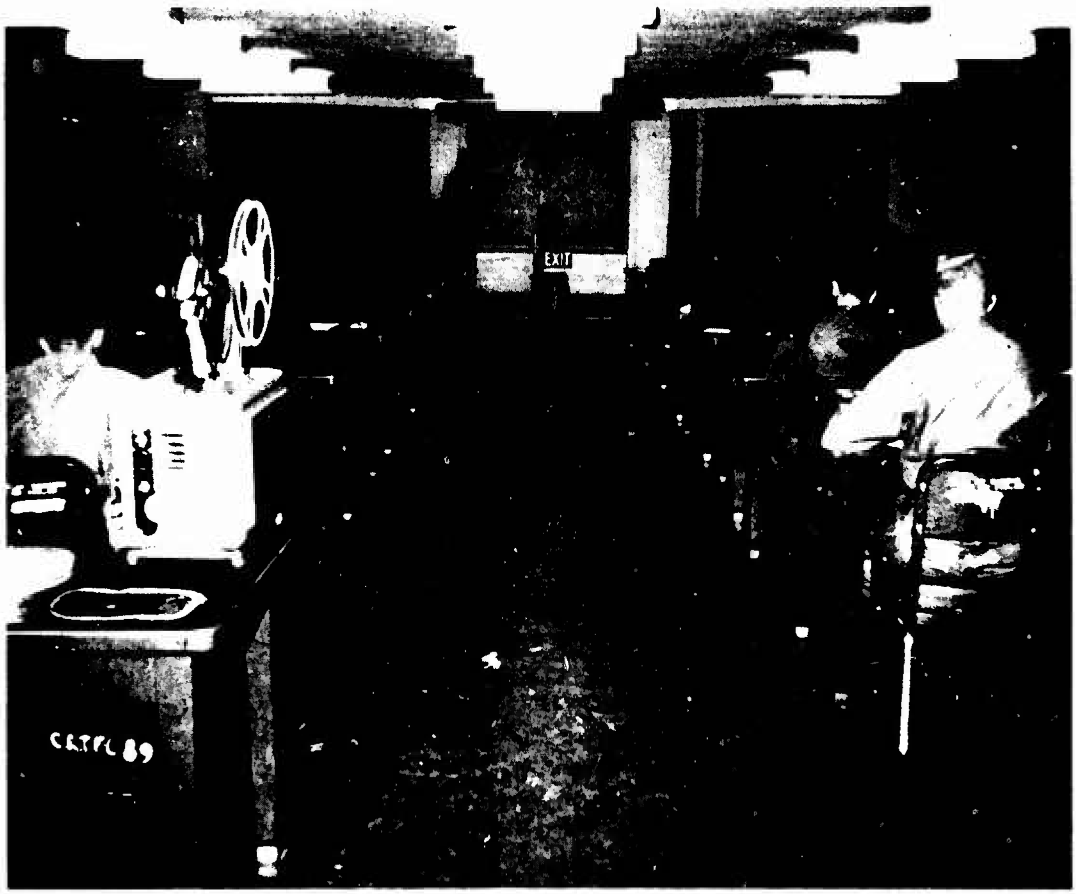


Figure 4

Of the 101 classrooms occupied by DOMT, the one in figure 4 is typical. It is a World War II type barracks building with the posts removed and instructional equipment added. We also have 14 classrooms in new permanent buildings such as Braman Hall.

As soon as possible we get the students out of the conference classroom and stress "hands-on" training with the actual equipment.

Figure 5

Therefore, the bulk of each course is devoted to practical exercises. Let's take a look at some of our PE's and the associated training aids. Here we see an instructor coaching three students in bench timing a magneto from a reciprocating engine. Normally we consider a 1-to-4 instructor to student ratio as ideal for maximum student participation and understanding.

In order to provide you with a realistic view of a classroom demonstration utilizing a typical NCO instructor and appropriate training aids, I now introduce SFC Redfield who will conduct a briefing on components relative to the OH-6 (Cayuse) aircraft.

Good morning, Gentlemen, I am SFC Redfield of the Cargo/Observation Division. This is a composite OH-6 trainer that we use to teach

students the functions of slight controls, power train system, and the rotor system. This type of trainer is ideal since the students can see the complete system. We also have a T63-A-5A turboshaft engine cutaway which is the actual size engine installed in the OH-6. We utilize this training aid to teach engine fundamentals showing the operation of the compressor, gas producer, power turbine and the gear case.

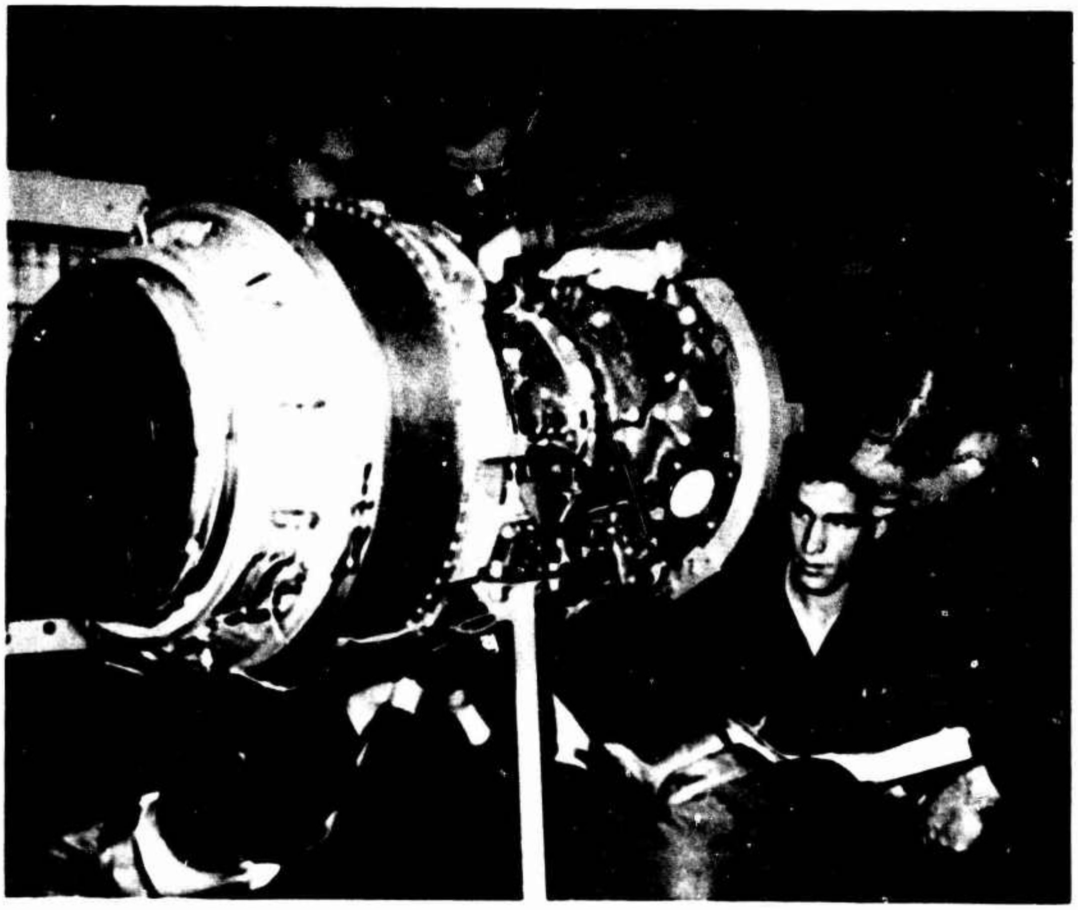


Figure 6

In figure 6 we see a group of students working on a T-53 turbine engine. We have removed this engine from a UH-1 Huey Helicopter, placed it on a stand, and now the students work on the engine separately. This illustrates the utilization of system trainers instead of using a whole aircraft. This is an efficient concept of training because we can take one aircraft, remove the engine, put it in one place for instruction, the transmission and rotor head in another, the tailboom in another, and the basic fuselage in another. Therefore, instead of being restricted

to only four students around one aircraft, we can put 16 students around the parts of one aircraft. We have found our training using this concept to be very effective. During the last phase of instruction, the student gets to perform an inspection on the whole aircraft, utilizing the knowledge he gained on the separate systems.

Figure 7 is another example of teaching on systems type training aids. These UH-1 tailbooms are used for teaching the tail rotor system. They are located in one building and mounted to the interior walls with the exact joining angle and connections as on the aircraft.

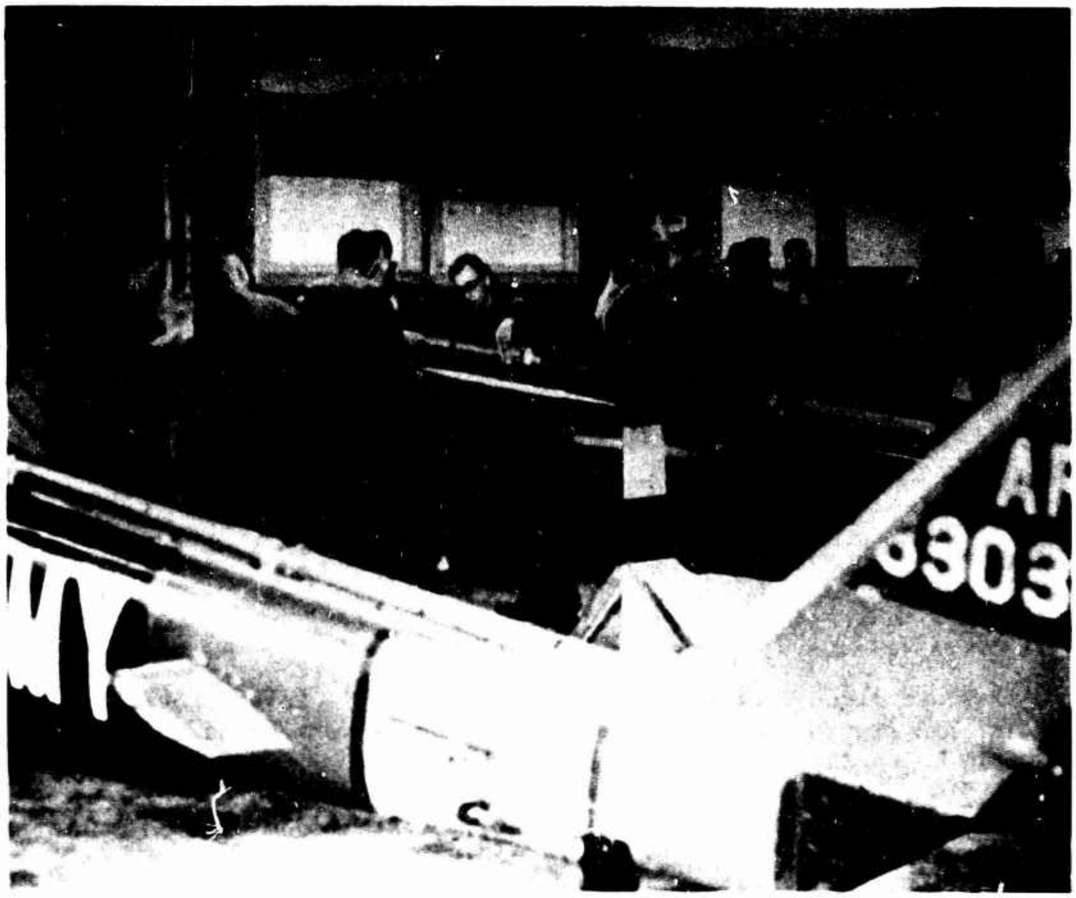


Figure 7

Figure 8

We also use flyable aircraft, of which we have 11 in our total fleet of 91. In figure 8 we see a group of students working on a flyable UH-1 in which they may end up as crewchiefs.

Figure 8 also points out one of our prime teaching objectives. We teach the student to use his manual and not rely on his memory for performing maintenance or making adjustments.

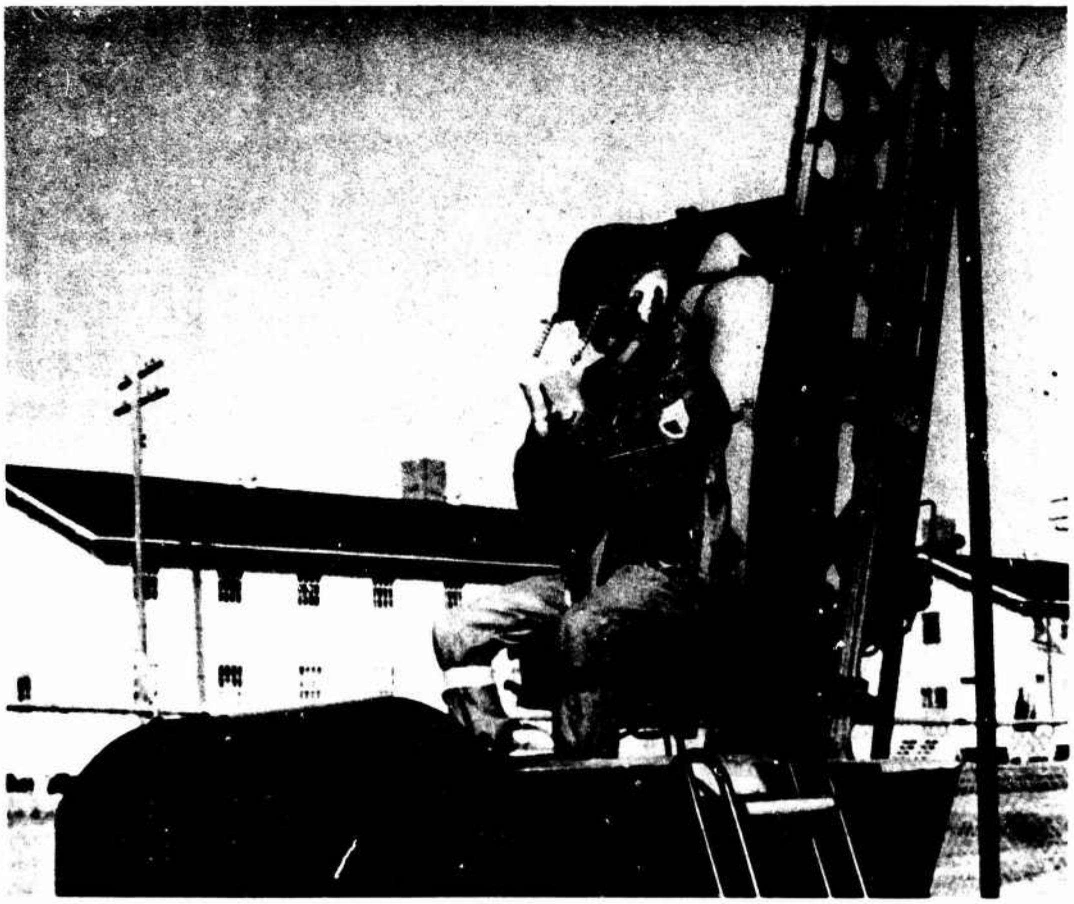


Figure 9

Actual aircraft and locally fabricated training aids are not our only training devices. This ejection seat trainer in figure 9 is a contractor-produced device used for training of aviators and crew-members in the use of the Martin-Baker Ejection Seat found in the OV-1 Mohawk airplane. The explosive charge used here is somewhat less than the one used in the aircraft for actual ejection.

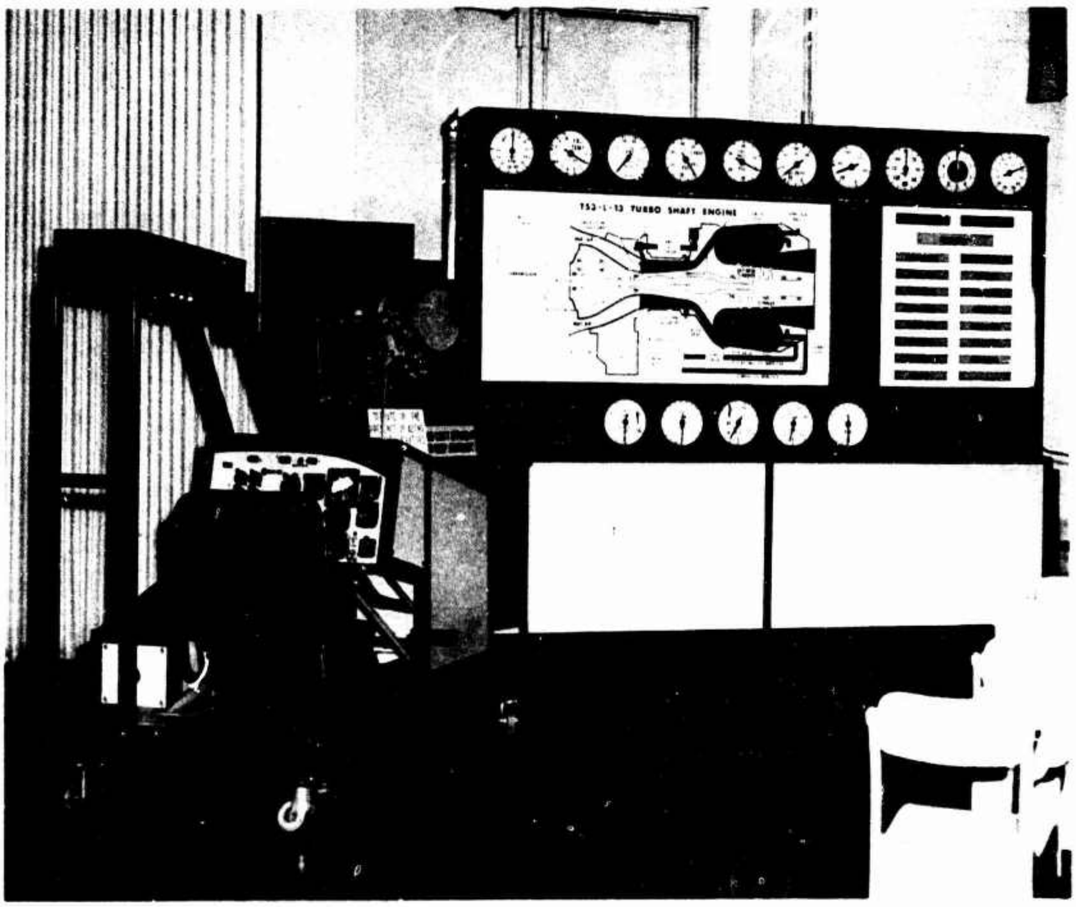


Figure 10

In figure 10 we see a computerized engine trainer that enables teaching starting procedures and troubleshooting in-doors without the danger of damaging an actual engine. This contractor-produced simulator is composed of five main components: UH-1 cockpit, instructor's station, fuel control station, display board, and computer. The pilot's flight controls, instrument readings, and caution lights all function according to the student's actions. The entire class may observe the fuel flow and all instrument readings as a given procedure is attempted. The realism of this trainer is completed with amplified sound effects. Numerous malfunctions may be introduced at the instructor's station that require corrective action by the student.

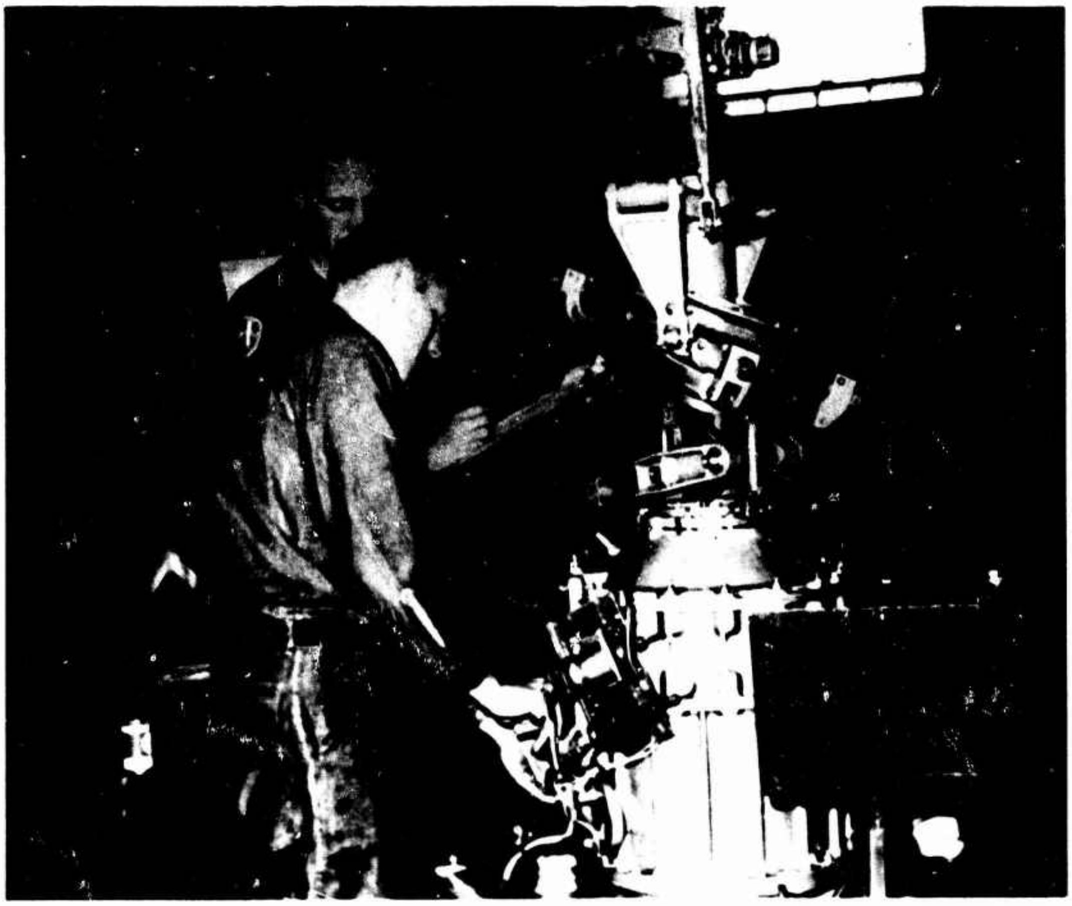


Figure 11

PE type instruction quite naturally leads to PE type examinations. In figure 11 we see a student performing a prescribed task and his former instructor, now the examiner, grades his performance. These PE examinations are set up in a county-fair type arrangement where we have several stations. The student will go from one to the other and make necessary adjustments and corrections. All of our examinations are graded with percentage scores.

Figure 12

This is a scene from the final week of the 67N20 course, where the prospective UH-1 repairman receives tactical environmental training in the Department of Tactics. Here in figure 12 the student is learning the door gunner skills that will be part of his crewchief duties upon his arrival in Vietnam. This tower simulates the UH-1 door. You will notice the machine gun hanging from the bungee cord which the student actually fires at moving pop-up targets down range. The same facilities plus others are used to teach the 67A1F Door Gunner.

Figure 13

When a student completes one of our courses, we feel that he has reached a plateau in his Army training and deserves to be recognized for his accomplishment. Therefore, we graduate our students with all the pomp and ceremony we can muster. Each student receives a diploma exactly like the flight students get.

DOMT
RECOGNITION OF STUDENT ACHIEVEMENTS

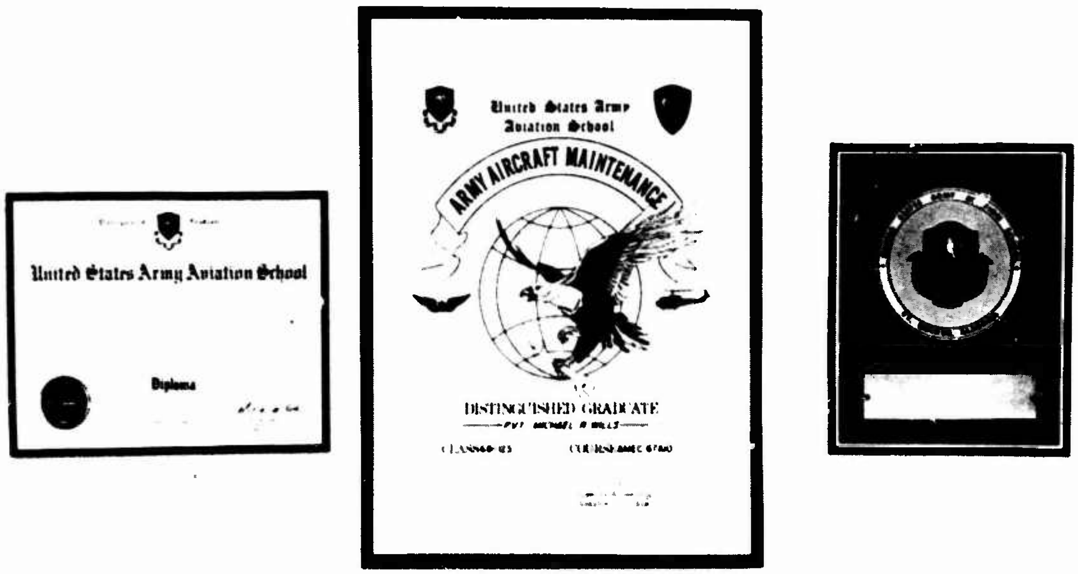


Figure 14

To add motivation and incentive, the top man in each course is designated a Distinguished Graduate and receives a scroll and distinguished graduate diploma. If a student is top man in Phase I and is top man in his MOS awarding course, he is awarded an engraved plaque. The Department of Maintenance Training graduates more students yearly than all other courses at Fort Rucker combined.

Are there any questions?

Gentlemen, this concludes the briefing!

PRESENTATION BY US ARMY AEROMEDICAL RESEARCH UNIT

The US Army Aeromedical Research Unit is a Class II Activity of the Office of the Surgeon General and one of eleven research laboratories directed by the US Army Medical Research and Development Command. It was established 6 July 1962 by the Department of the Army to provide medical research support for Army aviation and airborne activities. Our mission statement incorporates two major areas of concern: (1) To review the literature and to maintain liaison with all other agencies conducting research in aviation medicine (Army, Navy, Air Force, Federal Aviation Agency and other Federal and Civilian Institutions) and to make the Army aware of developments from these laboratories which might be applicable to Army aviation and airborne activities or the Army mission, and (2) To conduct timely and relevant research applicable to Army aviation and parachuting which may be of a fundamental or immediate nature.

Three principles have guided our approach toward fulfillment of this mission: (1) The emphasis in our laboratory is directed toward applied research, that is, research of a type that will achieve immediate payoff in the flying or parachuting environment. Investigators being what they are, congenitally curious people, there is some basic research underway in our laboratory; however, this work does not receive either the financial or command emphasis placed upon applied research. (2) The laboratory must be taken to the aircraft rather than attempting to bring the aircraft into the laboratory. In our minds it has been successfully demonstrated that one cannot fully simulate in a laboratory situation the psychological and physiological impact of flying upon the pilot. Consequently, we have no alternative but to study the pilot in the field as he is actually flying the aircraft. If one were to walk around our laboratory he would notice the results of this emphasis. We have no shake tables, flight simulators, or mockups. What we have are small, compact, rugged pieces of scientific equipment with internal power supplies, small enough in weight and cube so that they can easily be carried aboard the aircraft and will withstand the vicissitudes of flying. (3) Man is our primary experimental animal. A previous commander of our laboratory used to say, "When they teach the rats to fly the helicopters, then we will study the rats". We have done and are doing studies using animals. However, these generally are done to demonstrate the safety of a procedure or a study method which is expected to be later applied to man.

Our staff is composed of 50 professional, technical and administrative specialists. The professional group are both military and civilian and include the disciplines of aviation medicine, internal medicine, cardiology, neurology, biophysics, biochemistry, physiological optics, audiology, experimental and sensory psychology, pathology, and physiology. The technical and administrative staff includes highly skilled craftsmen for electronics and mechanics development, metal, wood and plastic fabrication, medical illustration, and photography.

One could not hope to cover the complete extent of research going on in our laboratory at this time, so I would like to take some representative studies and comment upon them to indicate the type of interests we have in the man-machine interaction, pilot safety, crash protection, and new product development. I might add, however, that if you have interest in the US Army Aeromedical Research Unit and its operation we would welcome your visit at any time and will be happy to show you any or all of the research going on.

Our organization has had considerable interest in the flight helmet. The ideal helmet has not as yet been developed and I doubt that it ever will be. There are too many compromises required because of the large number of functions expected of the helmet. It is expected to provide crash protection, some degree of fragment protection, eye protection, acoustic protection, an enclosure for communication electronics, a suspension system upon which oxygen masks, face protective masks, and flash protection devices can be hung. It is suppose to be comfortable, to provide sufficient ventilation for cooling. It should be easy to put on, difficult to remove, inexpensive and durable. We are presently in the final stages of evaluation of a helmet which we hope will replace the present APH-5 and AFH-1 as a standard helmet for Army use. One might wish to point out that our sister services are also still struggling with the helmet problem and, in fact, Air Force flight surgeons complain that their pilots wear their helmets only about ½ the time at best.

One must think first of the man who is asked to wear the helmet and with that throught we have studied the trade-offs, performed extensive physiological, engineering, and user testing in the field, and have decided upon a compromise which we feel will best meet the needs of the Army aviator. The resultant helmet is similar in shape to the Navy SPH-3 helmet. It has a sling suspension. The helmet shell with liner weighs about 1.25 pounds and with electronics and other hardware attached will weigh approximately 3.27 pounds. The shell is made with a ratio of 60% fiberglass, 40% resin, and is .095 inches thick with allowable limits plus .015 inches and minus .000 inches. The helmet is feathered somewhat below the head band which will decrease its weight and make it somewhat flexible along the lower margin to make donning easier. Tests indicate that a helmet of this sort requires

about 98 foot pounds to crack the helmet shell of which 83 foot pounds are absorbed by the shell and liner. Ear cups have glycerine seal and provide excellent acoustic protection. User tests on a small sample of experimental helmets using instructors from the Department of Rotary Wing as subjects indicate that although there are some difficulties with the helmets tested, in general the helmet is acceptable to the user and felt to be an improvement over the present APH-5. Some of the user complaints include that the helmet is difficult to don because of the stiffness caused by increased shell thickness. This will be improved by the proposed feathering of the margins of the helmet below the head band. Users desire double visor, one clear and one tinted. We have had one unusual complaint with this helmet. The pilot is unable to hear noises produced by the engine and transmission as well as he has in the past. I might say that is the sort of complaint we can live with. However, instructor pilots indicate to us that after two to three days of use one becomes adjusted to this quieter flying environment and then is able to correctly interpret the quieter sounds which reach his ear from aircraft moving parts.

We know that the helmet which we are recommending is not the ultimate helmet. There is considerable work which still needs to be done and we hope to have an opportunity to participate in this work. However, it is our impression that the helmet which we propose is sufficiently better than the APH-5 that replacement should be initiated as fast as production will allow.

In association with the Naval Aerospace Medical Institute at the Pensacola Naval Air Station, we have been conducting research at Wayne State University using their acceleration facility to study the effect of head-helmet mass and center of gravity upon the head and neck during crash decelerations. Although we have just begun the first of our human runs, a number of interesting observations have already been made. For instance, although vehicle acceleration was only 2.8 G, resultant acceleration measured on the head and neck has been as high as 8 G. This fact alone is worth the cost of this research effort and, I assure you, we will approach with great caution the expected limit of 10 G proposed for the vehicle in our present test series. It appears that in crash investigations it is not enough to know the G loading upon the aircraft or even the seat. The head might be experiencing remarkably higher accelerations than surrounding hardware. This work will be of great importance in assisting to determine the optimum weight acceptable for the crash helmet and how the center of gravity of the head-helmet mass should be adjusted. It should provide information for improving restraint systems in Army aircraft. Considerable scientific information is being derived about the effect of head movement upon the head to trunk coupling in a live subject, and will allow us to relate previous work done on anthropomorphic dummies, animals and cadavers to a live man.

Our section in physiological optics is presently deeply involved in the development of an improved and less expensive spectacle for use by Army aviators. Present sunglasses have a metal gold-plated frame and glass lenses. Because the frame must be gold-plated to prevent development of metal-induced contact dermatitis in sensitive individuals, the frames are usually expensive, costing over $4.00 per frame in lots of 50,000 or more. Expense is further increased because, in marrying the glass lens to the metal frame, the glass is commonly stressed by the rigid metal frame and about 50% of glass lenses are chipped or broken during fabrication. An additional significant percentage of glass lenses are broken during initial shipment or by slight impact early in their useable life. In contrast, plastic frames cost about $1.00 per frame, and breakage associated with fabrication is less than 2%.

Plastic lenses also are being evaluated. They are less expensive and lighter in weight than glass, have higher transmissivity than glass, and non-breakable, and consequently, will not shatter and cause face and eye lacer tions upon crash impact. An additional advantage to be realized in the near future is that it will soon be possible to manufacture plastic lenses, pressed to prescription, merely by typewriting the desired prescription into a computerized lens press and the lens press would then automatically turn out from a blank a finished lens to the prescription originally entered. This would greatly simplify and speed up lens production, but this type of operation cannot be conducted upon glass lenses.

A preliminary study of various frame styles has been conducted and an acceptable compromise of shape and material has been selected. At this time both tinted and non-tinted, CR-39 lenses are being evaluated by experienced aviators on this post.

I am sure you are all familiar with sky hook, a man-rated ground to air retrieval system which has been under study by all three services for the past 8 years. The present interest of special forces in this system is its usefulness in retrieval of patients from areas denied to helicopters either by terrain, distance, or tactical situation. Our laboratory was asked to monitor and evaluate the system to advise regarding the types and severity of the injuries and disease a patient might have and successfully tolerate sky hook evacuation, and the effects imposed by the retrieval technique upon injury and disease pathophysiology. In association with the Naval Air Development Center at Johnsville, Pennsylvania, we studied nine adult, male, blood-depleted subjects exposed to G fields comparable to those anticipated in sky hook liftoffs and were able to determine that if the G loading is applied to the patient from front-to-back, as is desired, the subjects, depleted on the average of 1,004 cc's of blood, were able to tolerate these G loadings without significant deterioration of their clinical condition.

An enclosed litter has been designed and from 8-19 July underwent initial engineering tests at Eglin Auxiliary Field #1. Our monitoring equipment upon the litter used during the engineering tests indicates that the majority of the G loading is not in the front-to-back axis, as is most desirable, but is in the head-to-foot axis and, consequently, the major advantages of litter lift-off rather than harness lift-off has been degraded. It is also of some interest to note that sound pressure level measured inside this enclosed letter during lift-off and flight showed sustained noise levels in excess of 124 db overall, about 10 db louder than that experienced in the pilot's seat of a UH-1 helicopter in flight. This system has been returned to the contractor for further work to correct these deficiencies.

Most of my discussion to this point has related to the aviator and aviation problems but our laboratory does have considerable interest in problems associated with military parachuting and for the benefit of the parachutists in the audience I would like to take a few moments to briefly discuss several research projects which relate to airborne activities. To my knowledge, we are the only laboratory in the Army to which parachutists may go with their physiological problems.

In the fall of 1965 we did a study at Fort Bragg, North Carolina using members of the US Army Parachute Team as subjects. Twenty-seven healthy, male parachutists made a total of 98 exits from aircraft in flight. During the parachuting sequence, which included 20 seconds of free fall, we continuously recorded the electrocardiograms of these experienced parachutists. In spite of the vast experience of these jumpers and their apparent exterior calm, their heart rates at the time of parachute rip cord pull were on the average 180 beats/minute, and five of our subjects had heart rates of 240 beats/minute at the time of rip cord pull. It was previously not felt possible for a heart to beat at this speed and still be simple sinus tachycardia. However, these rates returned to normal slowly and over a period of about 30 minutes after rip cord pull indicating that this tachycardia was in fact not abnormal but was a normal physiological response to what the autonomic nervous system identified as a life threatening situation. We have maintained our contact with Army parachutists at Fort Bragg, both the US Army Parachute Team and the Halo Committee, special forces training group, and have participated with them in the development of recommendations for the physiological training of Halo Parachutists and the establishment of physical standard for Halo Parachutists.

In summary then we have the US Army Aeromedical Research Unit, a relatively small organization devoted to the study and protection of man in the flying and parachuting environment. We look upon ourselves as applied investigators and perform mostly research which relates directly with the aviator and his environment. Again let me extend to you an invitation, please come visit us if you have interest in our operation,

if you have suggestions for research, or if you feel we can be of benefit to you in the performance of your duties.

PRESENTATION BY THE DEPARTMENT OF AEROMEDICAL EDUCATION AND TRAINING

THE ARMY AVIATION MEDICINE PROGRAM

What is the mission of the Department of Aeromedical Education and Training?

The Department of Aeromedical Education and Training USAAVNS has the overall mission to advise the commandant of USAAVNS on all matters pertaining to Aeromedical Education and Training. To plan supervise and corordinate the aeormedical education and training activities of the USAAVNS. In brief, to be responsible for the Army Aviation Medicine Training Program.

What is "Aviation Medicine?"

Aviation medicine can be defined, as the art and science of clinical, preventive and occupational medicine as applied to those who serve within the aviation environment.

The Army aviation medicine concept is preventive in that our major efforts are concerned with the preservation of health in a population which is select in terms of health and safety.

It is environmental in nature in that we are dealing with the general psychophysiologic problems in a group which has been placed in a relatively hostile or unnatural environment. To accept the oft quoted philosophy that "If the Good Lord had wanted man to fly, he would have given him wings" is unrealistic. Man does fly, and it is our responsibility to see that he continues in the environment of optimum health and safety.

It is facilitative in direction in that it is our primary responsibility to provide the required medical support for the general aviation program. Carried one step further, it is the function of Army aviation to play a supportive role in facilitation the Army's over-all mission of defense.

It is military in orientation and it is necessary and important to differentiate between the role of military medicine and its civilian counterpart. The necessity to provide optimum support for specific mission completion results in a need for more rigid selection and continued quality control of our military aviation personnel. The requirement for the Army aviator to fly is dictated by this need to complete a mission successfully rather than satisfying a fixed schedule or personal desire.

What is a Flight Surgeon?

As the child has a pediatrician for his specialist and the pregnant woman an obstetrician the aviator also has a specialist - the flight surgeon. As a corollary to the definition of aviation medicine a flight surgeon then is a physician who has received additional special training which enables him to recognize and cope with the problems encountered within the aviation environment. The question is often asked why a flight surgeon, why a specialized medical support for the Army Aviation Program. This can be justified in many ways, but essentially can be reduced to three main points.

1. The Army aviator's environment.
2. The Army aviator's training.
3. The Army aviator's equipment.

The Army aviator's environment is a hostile, unforgiving realm which is entered when man leaves his terrestrial bounds. It has associated with it unique medical, physiological and psychological problems which are encountered nowhere else but in the atmosphere. Such phenomenon as the decrease in atmospheric pressure and oxygen content of the air as man ascends; the constantly changing gravitational stress in flight which subjects man to accelerative forces not experienced on the ground; the changes in spatial orientation which can lead to sensory illusions of flight; the thermal, vibratory and acoustic sensations which adversely affect the Army aviator and a multitude of other related factors which adversely affect him in flight are but a few of the unique aspects of aviation medicine which require specialized medical training for the Flight Surgeon.

The aviator himself and his training which is lenghty and highly technical makes him a unique individual. His value to the Army five years after graduation and in terms of future career potential is placed about one million dollars. This large investment needs the best protection that can be obtained. A specialist medical officer, the flight surgeon, knowledgeable in the many parameters of the aviator's media is essential, first in the selection of the potential aviator to insure only the most fit are selected and secondly, once rated as an aviator to closely monitor this man's health to insure a full return on the Army's original investment.

The nature of the aviator's equipment big and expensive and getting more expensive, and the nature of his mission requires the medical support by an individual highly trained in areas of human enginerring, crash worhtiness and survival equipment. Only by training medical officers in these highly specialized and unique areas can we most effectively contribute to the overall safety and effectiveness of the aviation program.

The Army Aviation Medical Officer - Training and Qualifications

Based upon the individual's specific interest and/or specific military requirements, the medical corps officer may receive the basic training in aviation medicine through one of three programs.

He may attend the USAF primary course in Aerospace Medicine which is ten weeks in duration and is conducted at the USAF School of Aerospace Medicine, Brooks AFB, Texas. Following the successful completion of this course, he will be sent to the US Army Aviation School, Fort Rucker, to attend the two and one-half week Army Aviation Medical Officers' Orientation Course. This course is designed to reorient the individual in terms of Army aviation medical policy, procedure, facilities, and philosophy. In essence, to bring him back into the Army's aeromedical way of life. Students attending this specific program will have utilized essentially eleven weeks of pipeline training time.

Medical officers may also be trained through the US Navy primary course in aviation medicine, which is twenty-four weeks in duration and conducted at the US Navy School of Aviation Medicine, Pensacola, Florida. The basic difference between this course and the Air Force primary course is the result of the flying training program which the Navy students attend. If physically qualified, they are given a flight training syllabus which will take them through the solo stage of their training. Following successful completion of this primary course, the graduates receive Navy flight surgeon's wings and are sent to Fort Rucker to attend the same orientation course as received by their Air Force-trained counterparts. In this training program, we are dealing with over twenty-six weeks of pipeline training time.

The third training program through which the medical officer may become an Army flight surgeon is the US Army's basic course in aviation medicine. This course is five weeks, three days in duration and is conducted by the Department of Aeromedical Education and Training of the USAAVNS, Fort Rucker, Alabama. As is already apparent, the total pipeline training time in this program is five weeks, three days. The program of instruction for this course was developed by taking the syllabi of the Air Force and Navy Courses and eliminating those areas such as specific administrative procedures, regulations and problems of high-altitude, high-performance flying which are not pertinent to the practice of Army aviation medicine. Although the course was initially developed as an expedient in terms of meeting the medical support requirements for the revolutionary growth of Army aviation in general, it has proven to much more than that. I would like to emphasize the fact that this is an intensified rather than a condensed course in aviation medicine. In addition to the academic aeromedical subject matter of the course, students receive

approximately ten hours of fixed wing and ten hours of rotary wing flight orientation and instruction. Feedback information from graduates in the field have indicated that this course has provided more than an adequate background and preparation for the successful practice of Army aviation medicine, and in most cases, better preparation for our purposes than was received by graduates of the Air Force and Navy courses.

In most cases after practicing aviation medicine in the field for one year, the flight surgeon is eligible to apply for the formal residency training program in aerospace medicine. The residency program consists of three formal residency years.

The first year is spent at an approved civilian school of public health where he receives training in such subjects as public health practice, general preventive medicine, tropi cal medicine, industrial medicine, biostatistics, forensic medicine, and functional organization and management. Upon graduation, the individual receives a Master of Public Health Degree.

The second residency year is spent attending the USAF advanced course in aerospace medicine. This is an extremely interesting year. Approximately fifty percent of the year is academic in nature and the individual receives training in depth in each of the allied clinical specialties and staffs the USAF Aeromedical Consultation Service. During the remaining fifty percent of the calendar year the resident attends a six week jet qualification course and receives training in the T-37 jet aircraft, arctic survival, desert survival, jungle and water survival, missile medicine, nuclear medicine and industrial medicine practice as it applies to the aerospace field. Liaison visits to the education and training, and research and development facilities of sister services, the US Army, US Navy, and Royal Canadian Air Force, occpuy an important part of this residency year.

The third formal year of this residency is a year of supervised practice and is spent at an approved affiliated training site under the preceptorship of a flight surgeon who is certified by the American Board of Preventive Medicine in aerospace medicine. Most Army residents have served this year of supervised practice at the US Army Aviation Center, Fort Rucker, Alabama. During this year, the resident is given the opportunity to practice. under supervision, the clinical, preventive, educational, and research and development

phases of aerospace medicine, and within these specified phases, he is given authority commensurate with his responsibilities.

In order to meet the requirements for board certification, the resident must spend three years in the practice of aviation medicine in addition to the three formal years of residency. At the present time, these three years or any increment of them may be spent either prior to or subsequent to his completion of the three formal years.

The speciality of aerospace medicine is one of the four subspecialty boards - Public Health, Occupational Medicine, General Preventive Medicine and Aerospace Medicine - governed by the American Board of Preventive Medicine. It is, in reality, a general specialty. It is horizontal in concept. By this I mean that most clinical specialities are oriented around body systems or therapeutic techniques. In this light, we may think of the clinical specialties as being vertically oriented, whereas the specialty of aerospace medicine runs horizontally and interfaces with the clinical specialties of internal medicine, otorhinolaryngology, opthalmology, neuropsychiatry, surgery and pathology. In fact, it is associated with all clinical specialties with perhaps the exception of two. Obstetrics and Pediatrics.

In terms of military management the opportunities for individuals in this specialty at the present time are excellent. This specialty is more akin to military medicine than most of the clinical specialties, and the number of people trained at the present time results in a supply and demand ration which favors the individual. They will fill key positions at the Army's Aviation Centers and eventually, many division surgeons' and Army surgeons' posts will be occupied by an aerospace medicine residency-trained specialist. A frequently recurring question is one which asks: "What you say in terms of military opportunities is fine, but what about the opportunities in civilian life for people who have been trained in this specialty and do not intend to make a career of the Army"? In answer to this question, I can say without reservation that the opportunities in civilian life are equally as good. The broad nature of the residency permits a flexiblity far beyond any that is allowed within the clinical specialties. From an aviation or aerospace medicine standpoint there is a significant demand by the major civilian airlines, airframe manufactures, and space industry contractors for individuals with backbround in this specialty. There is also a significant unfilled requirements in the FAA and NASA. With the background in preventive medicine, there

are innumerable opportunities available in the area of industrial and occupational medicine, public health, and general medical administration.

In terms of utilization, there are four major levels at which Army flight surgeons are assigned.

The Unit Level flight surgeon has completed his basic aviation medicine training and is assigned to an installation to provide basic medical care and coverage. He may be assigned either to the hospital or to the aviation commander of the given installation. From a standpoint of the ability to practice aviation medicine, the latter is a very acceptable organizational structure. At the present time, there are approximately 166 Army flight surgeons functioning at this level.

The second category of utilization is that of staff and command. These are Army flight surgeons who are assigned at staff and command levels such as the major Army commands, both in CONUS and overseas, Hq, USCONARC, and the Office of the Surgeon General. There are approximately fourteen Army flight surgeons utilized in this capacity.

The third category of utilization are those flight surgeons assigned in a consultant category. This group consists of Army flight surgeons who have received the basic aviation medicine training, but have also been trained in one of the clinical specialties. This group serves two basic purposes. First, they lend depth to the aviation medicine program. As we mentioned previously, aviation medicine is a horizontal specialty, and the flight surgeon receives considerable but not complete training in each of the clinical specialties. The needed depth for consultation required by the flight surgeon in many of the clinical specialties are provided by this group. Secondly, this consultant category fills a significant need. At the present time, there are many installations at which Army aviators may be assigned in insufficient numbers to justify the assignment of a full-time flight surgeon, but we can take one of the clinical specialists assigned to that installation and train him basically in aviation medicine. There are approximately 22 medical officers assigned in this category at the present time.

The fourth category of utilization is what we call the specialty. These are the individuals who have completed the formal residency training in aerospace medicine and are now board certified in this specialty. At the present time, the Army has nine people who meet these criteria.

There are several more who are completing the six year time requirement for eligibility or are in one of the program's three phases.

In considering the total numbers assigned in these four categories, we have approximately 225 functioning flight surgeons. As a result of the rapid growth of Army aviation in general and the present requirements to provide adequate medical support for Army aviation, there is an existing need for considerably more. Demand usually exceeds supply.

The Surgeon General's office tells us based upon the expansion of Army aviation and as a corollary to this the expansion of the Army aviation medicine program; by 1975 we will need on the Army wide unit level approximately 250 flight surgeons. The staff and command level - approximately 40 individuals and consultant copacities - approximately 100 individuals and the residency training program at some level of completion - roughly 50 individuals for an overall total of about 450 flight surgeons.

There are six major areas of responsibility for the flight surgeon which we consider basic duties and functions.

The first area, physical examination, is probably the least likely duty or function. The reason for this is rooted in our disease-oriented society and our basic medical training. The physical exam of large numbers of physically healthy people is not always professionally rewarding, however, it behooves us to remember that we are dealing with a preventive rather than curative concept in aviation medicine. Within this category of physical examinations, we do three basic types:

The initial or Class I flight physical which is required for initial entry into a flying training program is the most rigid and in doing this exam, we are interested in not only safety and proficiency, but also longevity. In order to make the training investment productive it has been calculated that a 10 or 15 year utilization of the trained aviator is required. This is a major reason for rigidity in medical fitness standards for this initial examination.

The periodic or annual flight physical is required and performed to insure safety and proficiency among our rated aviatr   rsonnel. In this area the initial investment has already been mau nd therefore, less rigid standards may be applied.

The "special" category of examinations are those required under specific circumstances such as when the aviator is to be removed from flying status for medical reasons or perhaps returned to flight status following an illness or injury. It is in this area that we utilize the consultant group of flight surgeons mentioned previously.

The second category of duties and functions is that of clinical care. This is probably the best liked but least productive in terms of the true concept of aviation medicine. It has been said, facitiously, that once the aviator becomes ill or is injured and unable to fly, he is no longer an aviation medicine problem. Please do not misunderstand me. I do not mean to belittle the importance of this function, but I am merely trying to place it in its proper perspective. From a clinical standpoint in dealing with the aviator, we would, when possible, prefer to be responsible for the health of his family as well. It has been said many times, and rightly so, by aviators and their dependents, that the flight surgeon is the closest thing to the civilian concept of the family physician that they have encountered within the military environment. By this concept of total care, we can do the best job in keeping the aviator healthy, happy, and safe.

The category of preventive care is probably the most productive, but many times least understood role of the flight surgeon. Another way of describing this function might be "aeromedical surveillance". It is within this category that the true meaning of aviation medicine is found. This function is best performed within the aviator's own environment: time spent on the flight line observing potential occupational or environmental hazards; time spent with the aviator and his family in developing a better working relationship, and time flying with the aviator in developing a working knowledge of the man-machine complex. This concept may be difficult to sell but is worthwhile in terms of greater efficiency in the promotion of health, safety, and effectiveness in the aviation unit.

The fourth duty and function is what we may call aeromedical staff advice. By the nature of his training, position, and job requirements, the flight surgeon is a staff officer with the responsibility of providing his commander with the best possible advice in the area of aviation medicine. This category is a broad one and includes everything from advice on specific problem areas to responsibilities as an active voting member on all aviation accident boards, faculty boards, selection boards, and flight evaluation boards. This function is unique to

aviation medicine. In no other specific area in the service do physicians routinely sit on administrative board functions as voting members. As an example: an individual who is failing the infantry officer school academically does not have a physician on his faculty board, whereas, an aviator who is failing the academic portion of his flying training program has a flight surgeon who sits as a voting member on his faculty board.

The fifth area of duties and functions involves the concepts of research and development, and all flight surgeons have responsibilities to be productive here. Significant contributions have been made by interested flight surgeons in the areas of applied research and development.

The sixth area is that of education and training, and each flight surgeon has a significant responsibility for the education of his assigned aviators in terms of presenting material on aviation health and safety. An individual who understands his environment and its effects on his body and performance will be a safer and more efficient Army aviator.

Although I do not wish to argue existing philosophies, I think it can be said with a considerable degree of truth, that when most people think about motivation, they are frequently thinking about money or other tangible rewards. It is in this area that the categories of designation and incentives fall.

Upon successful completion of the basic course in aviation medicine, and this may be either the USAF, USN, or USA Program, the individual receives the designation "Aviation Medical Officer", the military occupational specialty D-3160, the basic aviation medical officer's wings. He may be placed on non-crew member flight status and receive flight pay amounting to $110 per month. In order to continue to receive the non-crew member flight pay, the aviation medical officer must fly four hours per month.

After practicing as an AMO for one year and logging 100 hours of flying time, the individual may receive the designation "Flight Surgeon" (his military occupational specialty D-3160 remains the same), the flight surgeon's wings which consist of basic wing with a star, and crew member flight status. Crew member flight pay for the usual medical officer amounts to approximately $185 per month but is on a graded scale and will vary with rank and active duty time. In order to remain on crew member flight status, the flight surgeon must fly

a total of 80 hours per year with 20 hours of cross-country time and 15 hours of night time, of which five will be night cross-country. This minumum flight requirement is, with minor exceptions, the same as is required of the Army aviator.

After seven years in the practice of aviation medicine and 700 hours of flying time, the flight surgeon may apply for a change in designation to "senior flight surgeon". His military occupational specialty remains the same. He receives the SFS wings consisting of the basic wing plus a star and wreath and his crew member flying status continues.

For those officers who enter and complete the formal residency training program and receive their certification by the American Board of Aerospace Medicine, the designation and incentives remain essentially the same except for the military occupational specialty. Upon completion of the formal three years of residency, the flight surgeon is considered board eligible with an MOS of C-3160. Upon board certification, the flight surgeon is given the MOS B-3160. The military occupational specialty of A-3160 is awarded by the Surgeon General and denotes professorship status or national prominance in the field.

The Army Aviation Medical Training Program does not just encompass professional training of medical officers. The Department of Aeromedical Education and Training through its technical training division has the responsibility to provide Aeromedical and physiological training to aviators, mechanics, crew chiefs and other associated aviation personnel.

The technical training division is responsible for the Senior AMEDS orientation course. It is responsible for student aviator instruction and for medical enlisted technical instruction.

The Department of Aeromedical Education and Training has several projects somewhere in the phase of planning to implementation. These include the writing of an Army aviation medical officer's field manual, joint preparation with the Army Pictorial Center of the movie entitled the Army Flight Surgeon, the development of the Army aeromedical specialist course, the joint development with the Department of Tactics of the night vision trainer, and the three dimensional disorientation trainer, the joint funding with the Army Materiel Command for a low pressure chamber and sometime in the very distant future, development of the new building to house a physiological laboratory and classrooms.

In summary the Aviation Medicine Training Program of the Army initially trains the physician to cope with the unique medical problems generated by the aviation environment. Additional training in the formal Aerospace Medicine Residency Program broadens the flight surgeon's knowledge of medicine as it applies to the support of military aviation. The flight surgeon functions at the aviation unit level, the staff & command level, as a consultant, or within the specialty of Aerospace Medicine itself. Within these basic areas of responsibility, the flight surgeon performs physical examinations on flying personnel; provides clincial care for the pilot and his dependents; provides an active preventive medicine program; offers staff advice on aeromedical matters; and participates in research, development, education and training. Thus, by attempting to ensure a safe occupational environment and to preserve the aviator's health, the flight surgeon can actively contribute to the overall success of the Army Aviation Mission.

PRESENTATION BY U.S. ARMY BOARD FOR AVIATION ACCIDENT RESEARCH

CONTROLLABILITY OF NONCOMBAT ACCIDENTS

One of the stated purposes of this conference is to review the role of Army aviation in support of operations in RVN. As an accident research organization, USABAAR specializes in the one factor that limits this support more than anything else: noncombat attrition. This type accident is the usual result of a wide range of personnel errors or equipment shortcomings and, therefore, subject to control once the underlying factors are known. The unpleasant task I am about to undertake is in direct accordance with USABAAR's basic charter (AR 15-76), which charges us with enhancing Army aviation's efficiency, especially in a combat environment.

The seriousness of our noncombat attrition problem in RVN can be summed up in one simple statement: Almost one-fourth of our aircraft inventory in RVN is damaged or destroyed in noncombat accidents every year. Naturally, this staggering attrition rate has caused great concern at all command levels. One command letter expresses this concern: "The accident loss rate and the recurrence of preventable type accidents is of such magnitude that it tends to reflect on aviator professionalism, supervision, discipline, and ability to manage resources."

The question that faces us now is: To what extent can we control the factors that cause this prohibitive noncombat attrition rate? The answer to this question has to be based on an unbiased analysis of the true source regions of our accident cause factors. I use the term "source region" to indicate that there is more to accident investigation reporting and prevention than pinpointing personnel error at the working level. Take the following USARV statistics that reflect the recent cause factor distribution:

Pilot factor accidents	63%
Maintenance factor	4%
Materiel factor.	25%
Other and unknown.	8%
	100%

In as far as these figures statistically present the immediate causative agents in noncombat accidents, they are undoubtedly correct. However, when the same figures are used to determine priorities in accident prevention programs, they may create the wrong emphasis. Are our pilots really about 15 times as bad as our maintenance people? Are materiel malfunctions actually responsible for 25% of our mishaps? And, where does supervision fit in?

Let us look at a more meaningful breakdown also published by USARV. This slide shows the dollar cost by type of accident during the first five months of FY 1968:

		Number	Cost (x 1000)
1.	Materiel failure	86	$13,700
2.	Lost rpm/overgross	49	5,800
3.	Obstacle strikes	81	5,650
4.	Inadvertent IFR	15	4,000
5.	Midair/meshed rotors	8	2,500
		239	$31,650
	8 other accident types	85	10,100
	TOTAL	324	$41,750

The original USARV chart was simplified by listing the five major accident types in order of decreasing cost and by combining the eight lesser ones under one general heading. These five accident types account for about 75% of the total number of noncombat accidents and 75% of the cost.

We will start our discussion with an analysis of the underlying causes of the costliest accident type:

Materiel Failure

The statistical involvement (25%) of materiel failure in accidents would lead one to believe that some of the equipment our people have to work with falls in the junk category. Needless to say, that as long as we have one red-blooded American mother and her congressman in the country, this could never happen. Our equipment is not quit as bad as implied by the statistics, nor quite as good as we like to think. Also, we have been blaming materiel where we actually are dealing with system-induced materiel failures. The UH-1 engine is a good example.

The consumption rate of T-53 engines has become so serious that the Deputy Commanding General, USARV, warned all responsible commanders that it might be necessary to ration flying hours unless the following steps were taken:

1. Elimination of unproductive flying time (extended orbiting of lift flights caused by poor planning; unnecessary C & C aircraft; nonessential resupply missions, etc.).

2. Elimination of engine damage caused by ingestion of foreign objects and sand.

3. Allowing sufficient time for thorough inspections and maintenance.

These recommended steps definitely imply that our problem is not so much the engine itself but the way it is used, or rather, misused. In a recent letter, the 1st Aviation Brigade Commander stated that only 17% of our engine failures are due to engine component failure. That leaves 83% which can be directly or indirectly attributed to operational abuse, poor planning, inadequate facilities, and substandard maintenance. Further proof of the self-inflicted nature of the engine problem is the following quotation from the same brigade letter: "Why is it that one unit has engine failure after engine failure while another unit operating in the same environment has none, or at worst, very few?"

Notwithstanding the much-vaunted state of the art of helicopter design, we have our share of design-induced problems. We bought one helicopter with weaknesses in the tail rotor assembly. After more than six years of field experience and innumerable modifications, the problem still exists and keeps costing us aircraft. In the last three years alone, reportedly, 575 EIR's were submitted for this assembly. We try to compensate for ineptness in design or manufacturing by giving our pilots pages of instructions about what to do in case of tail rotor malfunction. We also try to offset the known criticality of parts and adjustments by burdening maintenance personnel with special inspections. (In all fairness, it should be noted that an extensively redesigned assembly is presently being tested.)

We don't hesitate to saddle line personnel with the responsibility to "babysit" major components of marginal design. We have one main rotor blade in the system which has to be inspected for cracks in the main spar every 25 hours. When an aircraft crashes and people are killed because of a blade failure due to noncompliance with inspection requirements, our wrath naturally descends upon the unit. However, what is the use of blaming this accident solely on maintenance personnel when we should be demanding less critical equipment for the people who make Army aviation what it is?

Our list of unexplained, catastrophic helicopter accidents is steadily growing. The mechanical and aerodynamic complexity of the aircraft, plus the extensive use of magnesium which vaporizes in a crash fire make it often impossible to pinpoint faulty equipment. Maintenance and materiel undoubtedly play a greater role than we can prove, but suspicions alone are not enough to bring about the necessary improvements. In addition, we tend to concentrate on pilot technique and judgment, even when he is handling an emergency. As long as there is a remote reason to say, "He could have saved the aircraft," we prefer to blame him rather than anonymous quality control channels or overworked mechanics.

Finally, we have to consider the effects of the combat environment on the use of our aviation resources. Although we now admit that mission accomplishment at any cost is unsound practice in a war of attrition, we are still stuck with a permissive attitude towards operational mishaps. We pay lip service to our regulations when we build enough loopholes into them to condone aircraft abuse at the whim of the individual. Four years ago, USASCV Regulation 95-5 stated that: "Except in cases of extreme emergency, when safety of flight is secondary (e.e., life or death), no U.S. Army helicopter will be operated in excess of maximum operating weight as stipulated in the appropriate operator's manual."

The current USARV regulations read the same, but what are we doing in reality? Let the commander of a UH-1C gunship unit give the answer. This is what he had to say in the accident report after he lost one of his ships in a takeoff accident: "It can readily be seen that these aircraft habitually operate in excess of 1,100 pounds over the maximum allowable takeoff weight. If all the fuel were drained from the aircraft, it would still be 100 pounds over gross. If 100 pounds of ammunition were removed, it would then be within limits, but have zero range, zero endurance, and limited fire power. The fact that these aircraft do fly daily is a tribute to the aviators operating them. To be able to accomplish the assigned mission, they must operate far out of the flight envelope."

We allow, and often encourage, our pilots to literally tear the guts out of our aircraft and engines, but in case of an accident, we will seldom admit that we are dealing with a management problem of the highest order. There appears to be no such thing as a helicopter that we cannot and will not overload. And for those with illusions about the helicopter's immunity to abuse and poor maintenance, it might be well to mention that the catastrophic failure rate of the helicopter compared to fixed wing is at least 30 to 1.

In summary, accidents caused by materiel failure can be reduced by:

1. Basing our procurement policies on field experience rather than the utopian claims of reliability and maintainability in design proposals.

2. Reorienting our EIR and quality control programs toward problem solving instead of developing means for our people in the field to live with these problems.

3. Demanding that aviation managers and ground commanders respect the limits imposed by maintenance requirements on the supporting capability of an aviation unit.

4. Enforcing professional compliance with the performance limitations of our equipment and personnel.

Lost rpm/Overgross

Accidents caused by operating helicopters outside their weight envelope for existing conditions used to be highest on the cost list. However, we changed their statistical improtance when we began to exonerate the pilot and his commanders by attributing more of these accidents to engine failure. In reality, engine failures are not so much the direct cause of these accidents as the result of constant operation at, or in excess of, established limits. Here again, we show our insincere approach to accident investigation and reporting. We seem to be more interested in the preservation of our image than our resources.

We used to scoff at pilots who said, If it will hover, it will fly. Good old days! Right now we are flying aircraft that can't hover and need a 4,000-foot runway to slide into translational lift. This unbusinesslike use of men and equipment almost amounts to Russian roulette. Finding a way to squeeze more out of an aircraft than the designer ever dreamed does not necessarily mean that we are smarter. In the long run, this is a costly way of self-deception. If the equipment we buy doesn't meet our requirements, we have only ourselves to blame.

To prevent this type of mishap, it has been recommended at least a hundred times in different accident reports that a performance check to be made before takeoff (Go-No-Go or Hover Check). Approving officials have endorsed this recommendation an equal number of times, but with few exceptions they seem to be afraid to put their foot down. It is true that universal application of a performance check would cause pilots to reduce their load, from time to time, to stay within the envelope. But isn't that the sole reason and justification for a performance check? We have to learn to think about our performance today in terms of capability tomorrow. The 1st Aviation Brigade Commander put it very bluntly when he said: "Sixty-five UH-1's were involved in major accidents as a direct result of overgross conditions in the first half of this fiscal year (1968)--more than enough to equip two assault helicopter companies."

A performance check is not going to solve all our overgross problems. There are times and places that such a check is not feasible (enemy fire, dusty conditions, etc.). Here, we have to rely on the judgment of the aircraft or the mission commander and the understanding of the ground commander. Individual judgment should be adequate for these circumstances when it is based on firm and professional command guidance.

Emotions, the need for recognition, a competitive spirit, and the urgent atmosphere that surrounds most combat missions distort our judgment of essential and nonessential risks. It reminds one of the ambulance driver who picked up a man with a broken arm and killed him in an ambulance wreck on the way to the hospital. There is such a thing as a "matter of life and death," but this term should not be used to condone or invite reckless behavior. Delivering a load of soft or not-so-soft drinks under adverse conditions may flatter the ego of those who know everything about troop morale, but it will seldom justify the loss of an aircraft and its crew.

In summary, accidents caused by loss of rpm and overgross conditions can be reduced by:

1. Basing our aircraft operations on the performance data provided by the manufacturer rather than on the desires of the ground commander or the skill of an above-average pilot. When we have reasons to believe that "the book" is too conservative, we should have it changed accordingly.

2. Standardizing and enforcing the use of a performance check under specified conditions.

3. Taking the guesswork out of helicopter operation with instrumentation that responds to gross weight, density altitude, and power available in terms of power margin.

Obstacle Strikes

The aircraft losses in this category are mainly the result of helicopter operations in confined areas, unsuitable LZ's, and congested parking and refueling areas. The damage sequence normally starts with a strike by one of the dynamic components (main rotor or tail rotor) or a lower fuselage collision with a hidden obstacle. The natural tendency of accident investigation boards is to treat this type of accident as any other collision. They'll probably list the direct cause factors as: Inattention, poor technique, or poor judgment on the part of the crew.

Under the inoffensive heading of contributing factors, they may list supervision in the form of a flight leader who made a downwind approach, a tactical commander who failed to properly prepare the LZ, or an installation commander who condoned hazardous conditions in the parking areas. Some accident reports may mention lack of crew coordination. The recommendations to prevent recurrence, naturally, are nothing but cause factors in reverse. This is all that can be done at the local level.

The accident report's first stop on its tedious progress through channels is the unit commander or appointing authority. Regardless of his concurrence or nonconcurrence with the board's findings, he must list the actions taken to prevent recurrence. Considering the large number of mishaps in this category, hundreds of recommendations must have resulted in hundreds of written corrective actions--mostly of a repetitive nature--without the desired effect. In other words, we know what to do about these accidents, but we hesitate to act firmly.

Fortunately, there are some exceptions, as illustrated by extracts from a combat aviation group's letter dealing with the prevention of tail rotor strikes: "When a mishap occurs involving downwind operations, the air mission commander will forward a statement through command channels to me that he advised against such operations, but was directed to proceed as a matter of tactical necessity by the supported ground commander." On the same subject, this letter also stated: "The shallow, high airspeed, high rate of closure 'tactical' approach with its associated high rate of descent, terminated by an abrupt flare is not an authorized procedure within the group."

The fact that subordinate commanders have to issue such directives can be interpreted as an indication of lack of standardization and enforcement policies at the highest level. One would expect that after about four years of intensive field experience in RVN, the best way to fly the different missions would be a matter of established and enforced procedures. This is more than sound aviation management; it is the only way to offset the accident potential inherent in our constant turn-over of personnel.

There is a definite need to impress the ground commander with the vulnerability of the helicopter to tail rotor strikes in confined areas. Where a propeller can cut its way through tree branches without serious damage, tail rotor contact with underbrush may be enough to cause loss of tail rotor control with all its catastrophic potential. The state of the art of helicopter design would be considerably advanced if a minor tail rotor strike against trees, ground, or water did not disable the aircraft or worse. Those of you who have a voice in future procurement policies should heavily weigh this operational handicap.

Probably the most inexcusable obstacle accidents are the ones occurring in and around revetments, often with loss of life. The pilot practically always plays a role in these accidents, but so do congestion, lack of clearly established hover lanes, nonstandardized revetment layouts, dust, and lack of discipline in general. Recommendations to prevent these accieents are the same, year in and year out, and show, in their repetitiveness, the lack of firm command action.

How long do we have to tell ourselves that the avoidance of this type accident is, in the first place, the combined responsibility of the team operating the aircraft? This includes, of course, the nonrated crewmembers. However, when we haven't even managed to specify the copilot's duties in the UH-1 handbook, it can hardly be expected that this will ever be done for the other crewmembers. This failure to establish rules for the use of all available talent in the aircraft is not only a constant, self-imposed hazard, but a reflection on our aviation management concepts.

In summary, accidents resulting from obstable strickes can be reduced by:

1. Standardizing and enforcing optimum operational procedures in and around LZ's and refueling and parking areas.

2. Establishing crew duties for all crewmembers aboard an aircraft.

3. Demanding compliance with minimum satisfactory standards for the layout of permanent and semi-permanent parking facilities and refueling areas, including dust suppression.

4. Alerting ground commanders to the vulnerability of the dynamic components of a helicopter in confined areas and the hazards of downwind operations.

Inadvertent IFR

This type accident is practically always catastrophic and often fatal because it is characterized by unplanned loss of visual reference, followed by loss of control or flight into obstacles, the stage-setting loss of visual reference can occur at night, in weather below minimums, or during takeoff and landing on dusty fields.

Loss of control after loss of visual reference is, in most cases, the closing event of a vicious circle that starts with lack of self-confidence, generated by lack of proficiency, and follow-up training. Once his skill is rusty, the pilot becomes reluctant to file and to fly IFR. He'll try to make it VFR, regardless of visibility restrictions, at the risk of flying into obstacles. Weather is not the only problem in this respect. Sudden loss of visual reference in dusty areas puts heavy, if not impossible, demands on the pilot's ability to transition safely to instruments. All in all, we have ample reasons to review our instrument proficiency policies.

Almost one-fourth (50 hours) of a helicopter pilot's total training time is devoted to instrument training. This is more than adequate to develop the skills necessary to keep an aircraft from falling out of

the clouds. However, the use of this particular skill is predicated upon the pilot's confidence in his skill, and here we may have a problem.

Many of our helicopter pilots get their instrument training in the TH-13 during the first 50 hours of advanced training. This is followed by about 50 hours of tactical training in the UH-1. As a result, we have the not uncommon situation that the brand new pilot is assigned to a UH-1 unit in RVN with limited instrument training during the last four months in the UH-1. To top it all, as soon as he arrives in RVN, we officially waive all annual night and instrument flying requirements. Apparently, we cannot be bothered with a pilot's proficiency in a combat environment, yet we boast that we have an all-weather capability.

To counteract this unhealthy situation, we encourage local commanders to give their pilots opportunities to maintain instrument proficiency even when it means finagling the necessary aircraft. This is another example of how we rely on individual initiative to offset system-induced hazards.

Accident boards, at times, try to incriminate the Aviation School in weather-associated accidents. The tactical instrument card has even been blamed by commanders for the overconfidence of an accident-involved pilot who had no intention to fly on instruments during a night takeoff in fog! This was the most convenient way to camouflage the unit's failure to monitor this pilot's proficiency.

In as far as our instrument training program is subject to improvement, it is mainly in the areas of timing and equipment, not in quality. A UH-1 pilot would definitely get more benefit from his formal instrument training if part of it, at least, was conducted in the UH-1, logistics permitting. It would also be beneficial if part of this training was conducted shortly before the pilot's graduation. This would make him more proficient upon arrival in RVN and encourage him to further develop this intangible skill. In combination, the two suggested changes might result in a better product with less total instrument training time. Another helpful step in the same direction would be to equip our basic flight trainers with standard instrumentation. The TH-55 cannot be flown without ground reference. Why not give the student a chance to gain experience with a professional instrument panel from the day he starts training?

Training and instrumentation alone are not going to eliminate all our weather accidents. We are heavily relying on the pilot's judgment when we send him out in marginal weather on a mission that forces him to maintain ground reference. How long should he continue when

visibility drops? What allowance should he make for a scratched windshield or an inoperative windshield wiper? Can he return and admit that the mission was beyond his capability without embarrassing himself?

Unit commanders must understand that a pilot's judgment under these circumstances is governed by his experience level and the guidance given him before he ever got off the ground. Operations officers should make it a rule to assign at least one experienced pilot per aircraft when the weather is expected to be marginal. This in itself is an excellent method to let the inexperienced sharpen their judgment under controlled conditions. And finally, let us not blame the pilot's judgment in accidents where he got inadvertently--as we put it--in IFR conditions when we encourage such behavior by disregarding established weather minimums, except when we need them to prove our own innocence after an accident.

In summary, so-called inadvertent IFR accidents can be reduced by:

1. Revising our instrument training policies to the extent that the recent graduate arrives in RVN with more recent experience and in the type aircraft he is expected to fly.

2. Reinstating the annual night and instrument flying requirements in RVN and giving the units the necessary support.

3. Enforcing compliance with established weather minimums on VFR flights regardless of mission urgency. (If we allow exceptions, we invite recklessness and showmanship.)

4. Adhering to existing dust control policies.

Midair/Meshed Rotors

This accident type is similar to that in the first category (obstacle strikes) with one exception: instead of a stationary object, the aircraft strikes another aircraft in the air or on the ground. The results are generally more spectacular, costlier, and deadlier.

In as far as these accidents occur on the ground, in congested or dusty parking and refueling areas, the earlier mentioned cause factors and recommendations apply. The common denominator in most midair collisions between unassociated aircraft or aircraft in a formation is lack of air discipline. With a great dose of self-protective hindsight, we distribute the blame between the crew, the traffic controllers, the mission commander, or whoever played a role at the working level.

We ignore the fact that we created the conditions that invited these accidents by our failure to correct any form of laxity or undisciplinary behavior before it causes a mishap.

One of our top aviation commanders in RVN recently made the following statement: "There is an apparent reluctance on the part of commanders to take punitive action when warranted. By winking at poor habits, poor techniques, or poor discipline, we allow lax or unskilled pilots to put themselves and innocent personnel in jeopardy." Exaggerated? We killed 14 people in two formation collisions because we tolerated the cocky, overconfident behavior of pilots who had habitually ignored the established rules for separation. The pilots involved were only the executioners; command passed the death sentence. If there is a note of bitterness in this statement, it is only because lack of discipline is the most inexcusable cause for attrition in a military environment.

Collisions on the ground and in the air can be controlled by:

1. Enforcing compliance with existing directives, not by issuing more of them.

2. Treating every willful and dangerous departure from written and unwritten standards as a breach of discipline.

3. Basing esprit de corps on the total accomplishments of the unit as a team, not on Gung-Ho-inspired individual feats.

Conclusions

There is nothing new or mysterious about the controllability of noncombat aircraft accidents. I'm sure that you've heard it all before in one form or another. What may have sounded new to you is my unsympathetic treatment of our noncombat attrition problem. I see no reasons to be nice about it. There is already too much sympathetic understanding displayed in our accident reports and not enough impatience with incompetence and compromise. We kill our people with friendliness.

Let me quote once more from a 1st Brigade policy letter: "It is not charitable, nor is it compassion for inexperience, when we allow a flagrant unsafe act to go uncorrected." If we make the same statement also applicable to gross manifestations of substandard behavior, it covers our basic problem in a nutshell. We have kicked the reasons for our avoidable attrition rate around for years, but we failed to be firm in our corrective actions because we were too nice, too lenient,

or too scared. We shun unpleasantness at the personal level without regard for the wholesale misery provoked by pretending all is well.

There is no longer a reason to outdo ourselves trying to prove that Army aviation plays an integral role in the total Army mission. This role has been well established by the dedication, initiative, and preseverance of our aviation units. We can now afford to take a more relaxed and business-oriented look at the problems we grew up with. Our satisfaction with the job that has been done should not obscure the proven need for changes that will enable us to do a good job better--and at less cost.

Finally, I hope that this review of the main factors that detract from our aviation support has put into a better perspective the areas where training does or does not play a role in our noncombat attrition problem. And even where training is not directly involved, you may be in a better position now to deliver a product with more immunity to the environmental accident potential he will be exposed to.

Where our colleagues of the other services are concerned, I like to say this: I am sure that Army aviation does not hold the monopoly on operational accident problems! Although you do not have to publicly admit the similarity of some of our problems, I hope that this frank discussion will lead to the type of cooperation between the services needed to get the most out of our combined resources.

PRESENTATION BY HUMAN RESOURCES RESEARCH OFFICE

As most of you know, HumRRO--the Human Resources Research Office of The George Washington University--conducts human factors research for the Army. The central concern of HumRRO reserach is the performance of the soldier; more specifically, how he acquires, maintains, and uses military skills in the pursuit of military objectives. Here at the HumRRO Aviation Division we have been concerned, for over ten years now, with the performance of aviators and aviation personnel. I would like to describe several of these research activities for you and discuss some of their implications.

First, let us look at what has happened to the Army aviation program during the past 10-15 years. The changes have been astonishing, even to those of us who have been intimately associated with the program during this time. Fifteen years ago there were barely 2,000 aviators in the Army, including 100 or so Aviation Warrant Officers; now there are over 16,000 aviators, about 8,000 of whom are Warrants. Up until FY 1963 the annual input into rotary wing flight training was 500 or less per year; now it is almost 7,000 per year. The changes in our hardware have been equally impressive.

What about our manpower management practices? Ten or fifteen years ago each aviator knew practically every other aviator in the system, most on a first-name basis. This made it relatively easy for command and management personnel to hand-pick individuals for specific assignments on the basis of considerable personal information. I am sure that Colonel Marr and others in the aviator personnel management business wish assignment procedures were still so personal. However, the growth of the Army aviation program in terms of personnel, aircraft and mission complexity no longer permits application of the highly individualized personnel management practices of our earlier years. In spite of this, the individual must be managed with maximum effectiveness if Army aviation is to accomplish its goals in expeditious fashion. The indivual aviator is no less important today than he was 15 years ago; if anything, he is more important.

Managing a program the size of Army aviation is a large responsibility. For example, if it costs $50,000 to train a new Army aviator, and we train 7,000 per year, then the total annual training cost is--I'll leave the computation to you. Incidentally, I am not advancing $50,000 as a definitive figure on the cost of training an Army aviator. I have seen various estimates ranging from $35,000 to $100,000. Suffice it to say that DOD has budgeted over $4.4 billion for FY 1969 to cover all service training costs, and over one-third of that is for aviation training.

How can the Army more effectively and efficiently manage its highly

important and expensive aviation program? A significant aspect of more effective management is a better means of predicting aviator performance. There are many other factors, of course, but let us examine this one.

I suppose one of the laments most fequently heard by the training researcher goes something like this: "Doc, can't you help us to get a better way of screening these trainees so we don't have to waste time training the duds?" The answer is that, given appropriate information, about people and a systematic means of using that information, you can make some rather precise predictions as to what they will do, i.e., how they will perform, in various situations, and thereby eliminate many of the duds. The commander--whenever he takes a command action--makes predictions about how his troops or how an individual will perform. Sometimes his predicitions are based on plentiful, valid information and his decisions are good; at other times his information is poor and his decisions may not be so good.

In approaching the problem of predicitng performance, then, our research problem is to determine what information is valid for predicting and to develop a systematic means of gathering and using that information. To put the question in perspective, let us consider the kinds of performance which we are mainly interested in predicting. While the aviator exhibits many kinds of performance in which the Army is interested--as well as many which are not of Army interest--we will restrict our discussion to three of these: First, performance in flight training or school; second, performance in combat; and third, performance with respect to career decision.

The financial and operational advantages to the Army of better prediction of these performances are obvious. Suppose, for example, that 1,000 of our 7,000 flight trainees wash out during FY 1969, and that it costs $1,000 each (which is probably an underestimate) to carry the man to the point of washout. This is a total of $1,000,000 spent by the Army for which it does not receive a single new aviator. Training performance is fairly easy to convert to dollars, but what does an ineffective man cost in combat? What does it cost to replace an aviator who leaves the Army after his first tour? I will not even hazard answers to these questions in dollar terms, let alone value of human life and value of successful operations.

Aside from the potential for directly reducing some costs, good prediction is necessary for effective system management. The aviator is a long lead--time production item, so accurate forecasts of aviator requirements must be made years in advance so that the recruiting, selection, and training systems can meet those demands.

The first area of prediction is that of performance in flight school.

At this level we can distinguish two types of prediction: first, to determine who will get into the flight program, which we will call primary selection; second, to determine what happens to the man after he is selected for the flight training program, which we will call secondary selection.

A number of factors are involved in primary selection. The would-be student pilot must meet a number of administrative requirements; he must pass a Class I physical; and he must score above a certain point on the Flight Aptitude Selection Test (the FAST battery). At this point, let me note that HumRRO does not conduct research on primary selection. Administrative requirements are established largely by DCSPER, DA, and the medical requirements are established by the Surgeon General. The Aeromedical Research Unit, under LTC Bailey, is currently investigating physical standards and their relevance to flying. The FAST battery was developed by the Behavioral Science Research Laboratroy. Establishing aptitude standards in primary selections for Army pilot training in the early 1960s was a significant step in making the selection process more effective. However, even with such selection we still have unsuccessful students and many other secondary selection problems.

A most significant aspect of the secondary selection procedure is related to flight grades. When the flight instructor or checkpilot assigns a flight grade to a trainee, he is, in effect, making both an assessment of a given performance and a prediciton about the likely future performance of the trainee. It is reasonable to expect, therefore, that grades at one stage of training might be related to grades at another stage and to performance in the field. At the same time, we would not expect the correlation to be perfect because human performance, particularly at the initial skill levels, is not a highly stable or reliable phenomenon.

A number of research studies, by HumRRO and other agencies, have shown that subjectives ratings of flight performance used in most flight schools are rather unreliable or unstable from the measurement point of view. The answer to this problem of low reliability is to get more standardization, objectivity, and detail into the evaluation process. We have followed this three-point approach to the development of the Pilot Performance Description Record (or PPDR), in use at the Primary Helicopter School at Fort Wolters. Figure 1 shows a sample page from a checkride PPDR which will give you some idea of the amount and type of detail noted by the checkpilot.

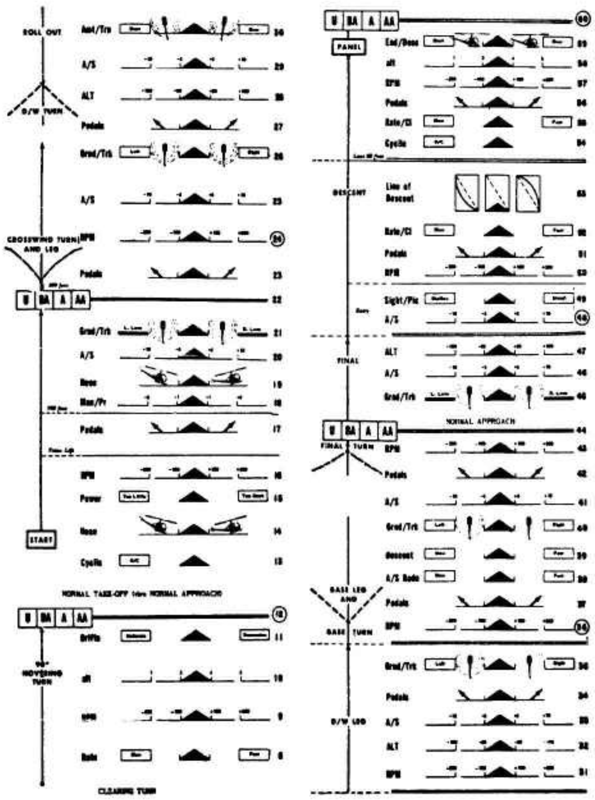


Figure 1

I will not go into detail as to how the PPDR is used at Fort Wolters. However, let me show you some "before-and'after" correlations between instructor daily grades and checkride grades. In interpreting these correlation figures, a perfect relationship would be indicated by a correlation of 1.00.

As you can see from figure 2, when using the traditional subjective method evaluating flight performance, the only correlation significantly greater than zero was at the Pre-solo stage. At this stage the daily grades and checkride grades were often assigned by the same person. At the other two stages, where the checkride was administered by an independent group of checkpilots, there was little or nothing in common between the instructor's view of the student's performance and that of the checkpilot. However, using the PPDR system there was substantial correlation, indicating considerable increase in reliability of evaluation procedures derived from using the PPDR.

CORRELATION OF MEAN DAILY GRADE AND CHECKRIDE GRADE BY STAGE OF PRIMARY TRAINING (USAPHS)

	STAGE OF TRAINING		
	PRE-SOLO	INTERMEDIATE	ADVANCED
SUBJECTIVE SYSTEM	.35◊	.08	.09
OBJECTIVE SYSTEM (PPDR)	.58◊	.42◊	.51◊

◊ SIGNIFICANT AT 5% LEVEL OF CONFIDENCE

Figure 2

This approach to increasing the precision of performance prediction boils down to a point of central concern in aviation, standardization.

Now I will turn to a different approach to predicting flight performance - one involving the use of a training device. Throughout the history of pilot training research there have been a variety of mechanical and other devices used in the selection of pilot trainees. In World War II, when the first systematic and effective means of measuring flight aptitude was developed, a number of mechanical or electrical devices - more properly called "apparatus tests" in the psychological jargon - were studied for their utility in predicting whether a trainee would pass or fail in flight training. Certain apparatus tests were found to be quite effective predictors of pass-fail, but were not included in operational selection test batteries because of their expense and difficulty of administration.

A few years ago, as part of our research program on flight training devices, we became interested in the possibility of using contact training devices in the initial primary flight portion of rotary wing training. The Army was concerned at that time over the fact that flight deficiency attrition was 30% or higher during primary. Most of that attrition was during the Pre-solo period. Accordingly, we examined several hovering trainers which had been developed by industry. We reasoned that there might be two principal benefits from the use of such devices. First, we felt ahat the trainee could learn certain flight skills on the trainer which would be of benefit to his learning to fly the helicopter. Second, we expected that his performance on the device would be predictive of his performance in the aircraft and that we might thus be able to identify the washout students more rapidly. Of these two benefits, I expected the second, or predictive, use to be the more important, particularly in terms of financial savings.

With this background we selected a hovering trainer for experimental evaluation.

Hovering Trainer

Figure 3

This device (fig. 3) is a small, flyable helicopter mounted on a ground-effects machine platform. It provides a more or less frictionless base and allows six-degree freedom of movement. All or almost all hovering maneuvers can be performed on the device.

Students from three successive WORWAC classes were administered an average of a little over five hours' training on the device during their preflight training before they received any training in the actual helicopter. I will not discuss the transfer of training data - the first area of benefit I mentioned - except to say that flight deficiency attrition for the experimental students was only one-third as high as that of control group students from the same classes, and that the experimental students soloed earlier and made better grades than did the control students. This benefit was much greater than we had expected.

With reference to the prediction of flight performance from performance on the device, we collected some 50 different objective measures of performance on the device. The next figure shows the highest correlation of the 50 device measures with each of nine different indicators of performance in the aircraft.

Three measures of flight performance (fig. 4) - time to checkride, checkride grade, and mean daily flight grade - were gathered for each of the three stages of primary flight training at Fort Wolters: the Pre-solo, Intermediate, and Advanced stages. In spite of the fact that the device measures were gathered some three or four months prior to the time of the Advanced checkride, they correlated with that checkride as well as did the average daily instructor's grade given during the Advanced stage of training. Statistically, these data allow pretty fair predictions of flight performance.

Our efforts to predict pass-fail were somewhat frustrated by the fact that so few of the device-trained students washed out. What it amounted to was that the student who received the rather modest amount of device training had a very high probability of passing.

This approach to predicting performances - the use of devices or apparatus tests - offers considerable potential. The Primary Helicopter School is currently involved in a follow-on evaluation of hovering trainers aimed at reducing the cost of the devices. When they procure operational models the precision with which student performance, including pass-fail, can be predicted will be considerably enhanced. In addition, there will be the other training benefits described, such as reduced attrition, better grades, etc.

CORRELATION OF SELECTED MEASURES OF DEVICE PERFORMANCE AND PRIMARY FLIGHT VARIABLES (USAPHS)

STAGE OF TRAINING

PRE-SOLO			INTERMEDIATE			ADVANCED		
TIME	CHECK	DAILY GRADE	TIME	CHECK	DAILY GRADE	TIME	CHECK	DAILY GRADE
.60◊	.52◊	.62◊	.44◊	.38◊	.47◊	.44◊	.48◊	.52◊

◊ SIGNIFICANT AT 5% LEVEL OF CONFIDENCE

Figure 4

As we conducted the research with the hovering trainer, we naturally asked ourselves <u>why</u> the small amount of time on the device produced such a marked decrease in flight attrition. The proposition that the trainee learned specific skills on the device which transferred directly to the helicopter seemed sound, but you might ask, though, why five hours of additional time on the helicopter would not produce the same result. We asked ourselves the same question. We then hypothesized that the device's principal utility might be that it provided a better training environment than the actual helicopter, one in which the trainee could develop <u>confidence</u> in himself and his ability to control a complex mechanism. At the same time, in another study, we were exploring aviator performance under stress; in that study, confidence was of concern, so we began to consider training as a means of building attitudes of confidence. This relates to our second area of concern, performance in combat.

Prior to all of this HumRRO Division No. 3 at the Presidio of Monterey had been engaged in research on stress, beginning during the Korean War. In their efforts to identify what it that makes one man a "fighter" and another a "non-fighter," they had developed a rather comprehensive psychological model of the soldier's reaction to combat stress. Briefly, the stress model predicts that when under combat stress the effectiveness of a man's performance is a function of both his skill and of his basic attitude of confidence in himself when in dangerous situations. In many situations, particularly combat or emergencies, the individual's confidence may be crucial. The goal of training, then, should be to develop both skills and confidence.

Confidence is described as having two components; a general background component, which is based on the sum-total of one's life experiences, and a situational component, which is specific to certain danger-related situations. Our Division No. 3 researchers at Monterey had developed paper-and-pencil tests of background and situational confidence within the context of infantry operations. We decided to adapt their approach to aviation. Flying is somewhat unique among Army skills in that, even during training and routine peacetime operations, there is a highly credible physical harm threat. In other words, flying can be stressful.

We began by working with the Warrant Officer Candidate trainee who enters the program through the enlistment option. As you know, these trainees take their BCT at Fort Polk, Louisiana, before going to Fort Wolters for Preflight and Primary Flight Training.

One might assume, aviation being the thrilling, dangerous occupation that it is, that the young soldier taking BCT who had volunteered for the flight training program would exhibit a higher level of background confidence than otherwise similar, but non-aviation, BCT trainees. Consequently, we administered our test, the Background Activities Inventory (or BAI), to 1,000 aviation and 1,000 non-aviation trainees at Fort Polk. As we expected, the aviation trainee is different; he is significantly more confident in danger-related situations as measured by our BAI. This figure shows the BAI scores of the two groups.

The next question is: What can we predict about the man's subsequent performance from his BAI score? We are currently engaged in this phase of the research and plan to relate these measures both to training and later to combat performance data. Let me discuss some of our preliminary data concerning the performance of these students during training at Fort Wolters.

Figure 5 shows data from seven FY 1967 and FY 1968 classes.

DISTRIBUTION OF BACKGROUND CONFIDENCE SCORES FOR AVIATION AND NON-AVIATION BCT TRAINEES

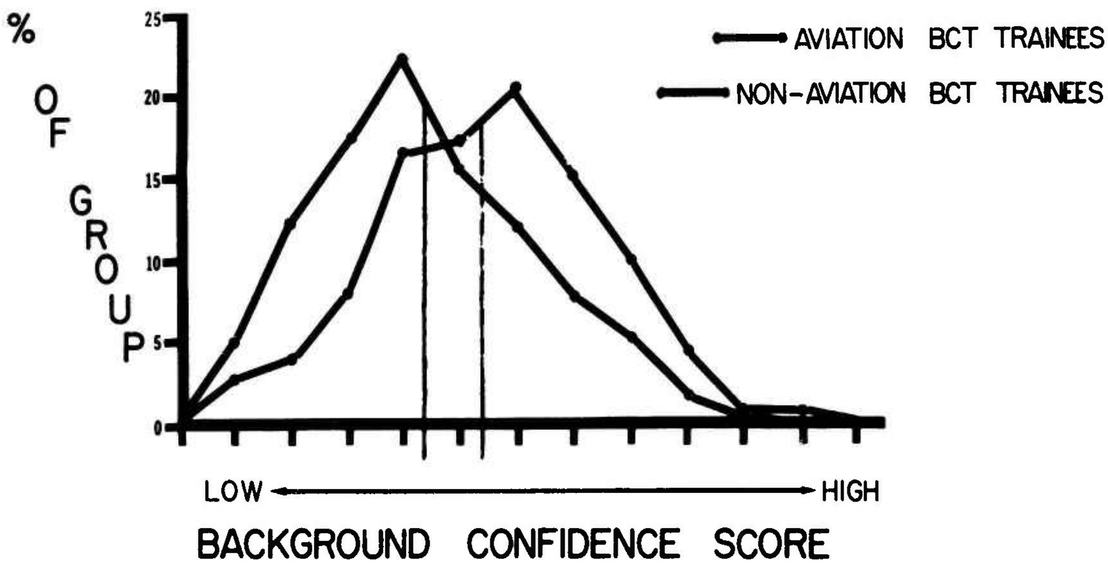


Figure 5

We have compared those students who were successful in the primary flight program, i.e., those who went through on schedule with their class, with the students who were eliminated for reasons of flying deficiency (fig. 6). As you can see, the flight deficiency washouts showed less confidence than did the successful students. The probability of a difference this large between the two groups occurring by chance is less than five times in 1,000. Keep in mind that these BAI measures were collected as soon as the students reported to Fort Polk for BCT, some four months or more before the "washouts" were eliminated at Fort Wolters.

From this we can conclude that with the BAI measure, we can predict a performance of considerable importance to the Army - success or failure in flight training. Note too that all of these students had already passed through the various administrative, medical, and aptitude screenings. The general point to be made here - and I think one with which

you will agree - is that motivation may be just as important as aptitude and skill, and in many cases more so. We have a great deal of data in the Army on what aviators can do, but we lack systematic data on what will do. The development and systematic use of motivational measures is one of the aims of our research.

BACKGROUND CONFIDENCE SCORES: SUCCESSFUL STUDENTS AND FLIGHT DEFICIENCY ELIMINATIONS (USAPHS)

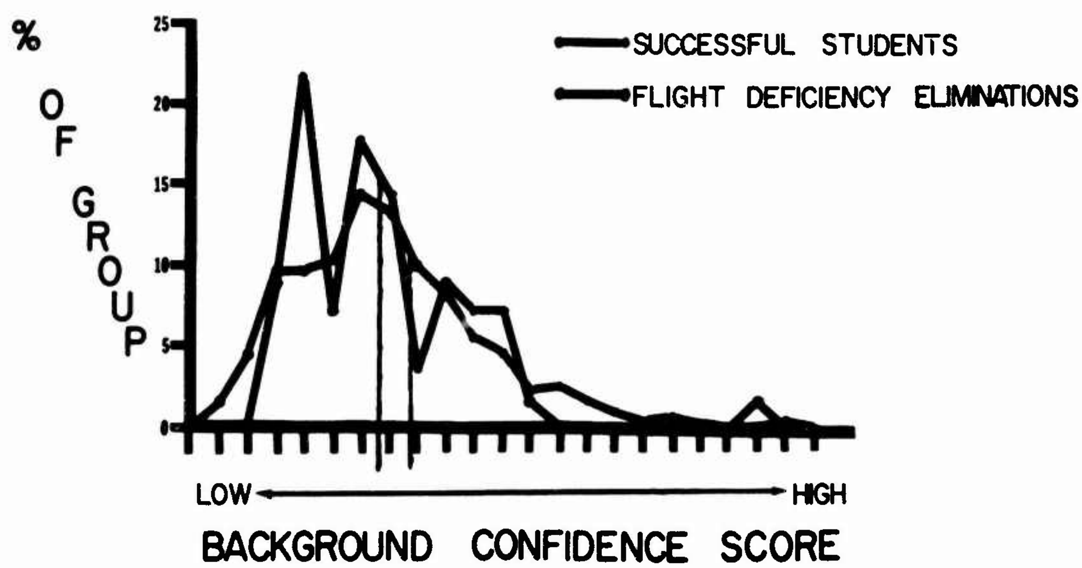


Figure 6

We have also examined the BAI scores of certain other groups. For example, students who have been set back for flight deficiency reasons score somewhat lower on the BAI than do the seccessful students, but not significantly so. Those eliminated for medical reasons, resignations, and various other non-flight reasons do not differ significantly from the successful students on the BAI.

Another group of students we have been particularly interested in is those who have accidents in training. There was a strong suggestion in our early data that those who have accidents during training were more confident than the non-accident successful student, i.e., that they were over-confident. However, this trend does not appear to be holding up statistically in our later data. We are continuing to study this area.

While the need for better means of predicting combat performance as a part of assignment procedures is obvious, let me cite a couple of other requirement areas for better means of predicting within the school or training situation.

The Aviation School and CONARC are currently developing training programs for the AH-56A Cheyenne. In working with them, one of the first questions asked of us related to who should receive Cheyenne training. Can we predict validly who will make the most effective Cheyenne pilots and gunners? The Cheyenne is a very sophisticated and expensive system, and the Army must do all it can to insure that those selected for Cheyenne training are most likely to prove effective.

Another area of need has been suggested to us by the OPD, Executive for Army Aviation, Colonel Marr. He has expressed some concern over the methods of selecting Army aviators to attend the USAF Test Pilot School. What are the critical varibles that will allow prediction of who will be an effective test pilot?

Examples of performance areas in which the Army would like to have more precise predictions could be multiplied at length. However, I would like to turn now for a moment to a discussion of predictions of career decision and retention in the service for aviators.

For several years, we have been studying the Aviation Warrant Officer group, a highly important part of Army aviation. As previously mentioned, there are currently about 8,000 Aviation Warrants in the Army. The retention rate for this group (as well as that for commissioned aviators) is a matter of considerable importance for the Army. Like the commissioned aviator, the Aviation Warrant has shown himself to be highly capable and effective in combat, and these men have experience and skill which the Army needs to retain. Each time one of these aviators

chooses to return to civilian life it costs the Army perhaps $50,000 to train a replacement, and the experience of a veteran is lost. Therefore, we have been investigating what the Aviation Warrant does in the field, how he is trained, and what his attitudes are toward the service and his role in it.

During the latter half of calendar 1966 we conducted an extensive questionnaire survey of all Aviation Warrant Officers. After gathering great amounts of attitudinal and other data we have been following the subsequent career decisions of this group. We were interested in the extent to which their responses to our attitudinal and other questions were predictive of career decision behavior.

In the 18 months between the completion of our survey and 1 July 1968, 602 Aviation Warrants, who had less than 10 years' service, have completed their three-year obligated voluntary tour or an extension thereof and have made their decision on staying in the Army or getting out. Of these, 449 decided to get out of the Army, and 153 have accepted indefinite tour status. This gives a retention rate among this group of 25%. We have compared the responses these retainees and attritees gave on our questionnaire. We find that many of their questionnaire responses <u>have</u> been highly predictive of their career decision behavior over the intervening 18 months. Departure probabilities for respondents who marked certain questionnaire alternatives have been over 90%.

A question of much current national concern is the relationship between questionnaire responses on polls and subsequent voting behavior. We will learn more about that in November. However, we can say that for Army Warrant Officer Aviators there is a solid relationship between questionnaire response and subsequent behavior. This leads us to believe that accurate predictions can be made about many important aviator behaviors. Moreover, the same data which allow such prediction provide information concerning the motivation of aviator behavior such as the career decision. Such information can allow the Army to make better informed and more effective decisions in managing aviators and the aviation program.

As you can see from this brief discussion, there is a wide variety of aviator performances which the Army is interested in predicting. We have techniques at hand for increasing the precision of some of these predictions; in other areas we do not. As we have worked in this area, we have come to believe that the vast amounts of information describing Army aviators and their performance should be systematized to provide better tools for the military manager or decision-maker. Therefore, we are embarking on an effort to develop an effective data bank on Army aviators and to develop information handling techniques to allow the commander or manager to use these data.

We plan to develop multiple correlation predictor systems for predicting significant aviator performances. The effort will have at least the three principal focal points previously mentioned - training, combat, and career. Ten years ago, or even five, it was not feasible to consider such prediction systems on an operational basis because there was no reasonable way to handle the vast amounts of data reasonably. However, developments in electronic data processing, principally the new generation of digital computers, make such prediction systems quite feasible for operational use.

I would like to make one thing clear. We are not talking about automating the decision precess; that should properly remain the commander's or manager's responsibility. We are talking about automating a great deal of the data handling and evaluation. The aim is to determine empirically what will predict what, and to provide usable information to the commander.

One very effective example of such a system within the training context is in operation at the Naval Aviation School at Pensacola. In their system all the information accumulated on each student is fed into the computer on a regular basis. At any point during training a member of the flight attrition board can query the computer as to the probability that Cadet X will successfully complete the flight course. Within 15 minutes the computer will provide a probability figure which is based on the cumulative experience with hundreds of similar students in the past. The Navy system has demonstrated its utility through more efficient utilization of training facilities and personnel, with reductions in training cost per aviator.

The research we are conducting, under the title Work Unit PREDICT, will combine a modification of the Pensacola system with the design and testing of systems which would attempt to predict important behaviors in the post-training, operational situation. This would involve performing multiple correlation analyses to evaluate available variables, designing a prediction system which would allow for the addition of new predictive measures as research shows them to be useful, and providing a system for constant evaluation of the predictor and predicted measures on an empirical basis. The result will be better management and utilization of Army aviation's most valuable resource, the Army aviator.

PRESENTATION BY DEPARTMENT OF DOI

THE AIRCRAFT MANAGEMENT CENTER

The Aircraft Management Center was established in March of 1966 under the staff supervision of the Director of Instruction. It is an Operations Center with representatives from several staff agencies.

The Center's mission is to provide coordinated and efficient management of the maintenance, scheduling, utilization and accounting for all aircraft assigned to the United States Army Aviation School.

When the Center was established, the School was flying an average of 28,000 flying hours per month. There were 560 aircraft in the School fleet at that time. We have increased the flying hour program to 70,000 flying hours and the present School fleet strength is 850 aircraft.

The Aircraft Management Center is a Center that cuts the staff functional lines between the USAAVNC and the USAAVNS. It coordinates the flight requirements of the flight training departments and the Programs of Instruction, the projected availability of aircraft from DCSLOG Maintenance Division and correlates them with G3 programs and Comptroller budget.

We have direct hot-line communications with the operations of each flight training department and maintenance operation at each airfield. The Center can provide timely reaction to training contingencies. For example, an aircraft with a Decca radio navigator required by a student at Lowe can be made available at Hanchey with minimum delay.

The Center was formed to cope with these problems that have always been associated with flight training programs: The problem of getting the utilization to match the program. The problem of providing the right aircraft with the right weapon, load, or avionics configuration. The problem of meeting changing training contingencies in a timely manner, precluding the loss of student training time. The problem of insuring that requests for aircraft are valid. The problem of requests for aircraft are valid. The problem of requests for aircraft that are excess to the actual needs, resulting in unnecessary maintenance requirements. The problem of lack of valid and timely reference and experience data available for use in developing future training problems.

After the aircraft are issued and flown, the Center has the capability of providing up-to-the-minute decision data as the result of the daily time-line and the daily flying hour reports.

The time-line report provides the status of training of each class in residence.

The flying hour report provides a timely comparison for up-to-the-minute status of the flight hour program.

With these reports the command has the capacity of making decisions based upon facts and in consideration of the total program. For example, a request for Saturday flying by a flight commander can be validated and the need for make-up training coordinated with requirements for overtime maintenance.

PRESENTATION BY US ARMY AVIATION TEST BOARD

Good Morning. I'm Colonel Carroll, the Executive of the Army Aviation Test Board. My presentation will cover general aspects of the board's test and evaluation role in the Army's research, development, test, and evaluation program. The Aviation Test Board, located at Cairns AAF, is one of the field test activities of the Army Test and Evaluation Command, known by the acronym "TECOM," which has its headquarters at Aberdeen Proving Ground, Maryland. TECOM is the Army Materiel Command's independent testor of the equipment developed and procured by the other major commands of AMC.

The Aviation Test Board has the mission of conducting about ten types of tests, but we are primarily concerned with service tests and reliability tests.

A service test is conducted under operational conditions by military personnel to determine if the item and its maintenance package are suitable for Army use. The service test provides the basis for recommendations on type classification of the equipment. Service tests are characterized by qualitative observations and judgments by military personnel who have a background of field experience with the type of materiel under test.

Reliability testing, like most efforts in the Army, is designed to accomplish a long list of objectives, but it is conducted primarily to determine service life and inspection cycles.

Our reliability tests are characterized by accelerated flying hour programs which compress years of operational use into a test program lasting only months. For example, during the testing of the CH-47 Chinook, the board flew one of the helicopters under test 2021 hours in one calendar year. We began the reliability test of the C model Chinook in May of this year, and in the first month of the test flew the three test helicopters a total of 532 hours.

By logging many flying hours on our test aircraft well ahead of field fleet usage, the board enables the Army to expedite delivery of new equipment to the field, while assuring that it is safe, maintainable, and logistically supportable.

These test programs frequently result in increased time between overhaul, or TBO, of components which reduces overhaul and component replacement costs.

A good example of the results of our reliability testing is shown in

the TBO on the T-55 engine in the Chinook. When first received for test, the T-55 had a TBO of 150 hours. Based on the results of board testing, the TBO has been periodically increased to the current field TBO of 1800 hours. Consider the savings accruing to the Army from this one program alone.

The board is usually authorized to exceed established TBO's in 200-hour increments.

If the TBO on a component happens to be decreased as a result of our testing, the safety of the item is assured while design changes are made, and accident losses are avoided.

Last month we lost our high time engine in the reliability test program we're running on the T-53 L-13 engine in the several Huey's. The engine, operating in a UH-1C, failed after being flown for 1946 hours.

Other tests conducted by the board are tailored to specific requirements, which are spelled out in the test directives received from TECOM. Generally, these tests cover certain selected aspects of service or reliability tests, and usually have more limited objectives and scopes.

Some aviation equipment still gets to the field without undergoing service or reliability testing. Not until the XM52 integral smoke generator had been in use in Vietnam, and a production quantity produced and delivered there, was the board successful in insisting on at least a safety test of the item.

When asked to concur in the classification of standard "A" without a service test for the XM18 7.62mm high-rate maching gun POD, the board strongly recommended that the item first be service tested, which was approved. We tested the XM18 on the UH-1C and found it to be very reliable, accurate, rugged, and easy to operate and maintain. We think it is almost as important to determine that equipment is good before it is deployed as it is to determine what faults exist in it. Our main task, however, is to determine if any deficiencies or shortcomings exist in new equipment.

As of today, we have 129 directed projects at the Aviation Test Board: 49 are in the testing phase, 12 are in the reporting phase, and 68 are in the planning phase. These projects include all the new aircraft such as the U-21, the Huey Cobra, the OH-6A, the OH-58A, a variety of Hueys, the C-Model Chinook, and the AH-56A Cheyenne.

Also included is an endless variety of other aviation equipment, such as the German-designed, British-built Frankenstien Airmobile Hangar; a Mohawk ejection seat; an aviator's flight uniform; ceramic bearings; strobe lights; armor; nickel-plated main rotor blades; airmobile

maintenance shops; 30 mm and 20 mm automatic guns; drop flares; tow missiles; CS munitions; IFF sets; Loran C and D; attitude indicators; forward-looking infra-red target detectors; radars; bullet detectors; windshields; fuel pumps; closed circuit refueling; and a universal armament control panel. The Huey is probably the most standard aircraft that we operate in the Army, but we have 46 different UH-1/AH-1 test projects underway or in the planning phase.

To accomplish this, the board is authorized 79 officers and warrant officers (although our current manning level provides only 55), 197 enlisted men, and 173 civilians, 42 of which are in the civil service grades of GS-12, 13, and 14. Our current TDA authorizes only two warrant officers, but we are making every effort to increase the total to 20, to better align board structure with that of operational units in the field. The board's maintenance contractor, Hawthorne Aviation, employs about 289 civilians from the Rucker Community. Hawthorne performs all of the maintenance on our test support aircraft; most of the maintenance on aircraft undergoing reliability testing; and only higher echelon support maintenance on aircraft undergoing service testing.

The board operates an average of 35 test and test support aircraft, representing every type in operational use in the Army today except the flying crane. We still have 3 Army Caribous, which are invaluable in supporting our tests at remote sites, and 2 F-51D Mustangs which are used for photo/chase missions.

Although the board is based here at Cairns AAF, we regularly conduct many of our tests at other, widely separated sites.

Desert testing is performed at Yuma Proving Ground, Arizona, during July and August of each year to determine the effects of extreme heat, sand and dust on the condition, operation, and maintenance of the test item.

Because of the unavailability and inadequacy of the ranges here at Rucker, armament tests which require determination of effects on targets are also conducted at Yuma, which has virtually unlimited range areas available.

However, Yuma's great distance from Fort Rucker (about 1800 miles), its desert terrain, and the high cost of conducting tests there make Yuma unattractive for anything other than desert training.

All testing of the AH-56A Cheyenne by the board, which will begin early next summer, will be performed at Yuma. For the Cheyenne test, the board will be augmented with a team of more than 250 personnel, which will be permanently stationed at Yuma until all testing is completed.

Plans are underway to construct a fully instrumented air-to-ground range at Yuma for this program.

High elevation testing of new aircrafts is conducted by the board in the vicinity of Pike's Peak and Fort Carson, Colorado. The U-21A was tested there last month. During high elevation testing of the Chinook, B-Model, a 3/4 ton truck was carried to the top of Pike's Peak as a sling load; landed; then loaded internally and flown off the peak again.

The Aviation Test Board also participates in tests conducted at Fort Bragg, North Carolina, by the airborne, electronics, and special warfare board to determine the air portability of Army aircraft using Air Force transport aircraft. We also support the AE & SW Board in tests to determine the suitability of Army aircraft for paradrops.

Tropic testing is conducted at the Tropic Test Center in the Panama Canal Zone - but we have done virtually none of that.

Extreme temperature testing under controlled conditions is performed in the Air Force's climatic hangar at Eglin AFB, Florida, which has the capability of temperature ranges from plus 125 degrees to minus 65 degrees fahrenheit. Soon after the OH-6A Cayuse was deployed to Vietnam, reports were received that overheating was causing the fuel to percolate, resulting in engine stalls. We immediately tested the OH-6A in the climatic hangar at temperatures up to 125°, and determined that overheating of the fuel was not the cause of the stalls.

Last summer during planning, we came to the conclusion that the congested environment of Fort Rucker and vicinity was not conducive to reliability testing. We therefore undertook to acquire an area that closely approximated the environment of Vietnam. Apalachicola, Florida, was chosen as the most suitable area available for our testing. It is close to Fort Rucker - only 90 nautical miles southeast of here by air. Any facility any closer than that would encounter the heavy training traffic around Fort Rucker. It is convenient to support testing there on a daily basis.

The Apalachicola area is surprisingly free of any air traffic other than our own. Except for Tyndall and Eglin Air Force Bases which are about 20 and 90 miles to the northwest, and which have posed no problems for our testing, there are no major airfields for several hundred miles. This translates into virtually unlimited availability of the testing areas, and allows good flexibility in the conduct of our test programs there.

But perhaps the most attractive feature of the Apalachicola area is the close similarity of the environment there to that found in much of the

area in which we are operating in Vietnam, and therefore provides realistic conditions for our extended reliability testing.

Temperatures and humidity are relatively high most of the time. Jungled forests, dense vegetation, and marshy terrain comprise most of the area. The water table is either at the surface or only inches below.

The loose sand and salt air conditions encountered in our operations on Sand Island are similar to those experienced from Tuy Hoa to Nha Trang, for example. Operating under these conditions enhances the validity of testing.

We have two water ranges at Apalachicola. Nine nautical miles southeast of this point we have an impact area of 25 square miles. It is marked by buoys serviced by the Coast Guard. We also have a fan-shaped range which has its apex on this point and extends 6 miles out to sea, and are in process of acquiring a land range just north of Apalachicola.

We have fired a tremendous amount of ammunition in weapons reliability testing at Apalachicola:

From the OH-6A armed with the XM27E1 -

282,000 RD of 7.62mm

From the AH-1G

XM-18 Gun Pods	- 558,745 Rds of 7.62mm
TAT-102A Turrent	- 834,107 Rds of 7.62mm
XM-157 Rckt Lchr	- 3,510 2.75-inch Rockets
XM-159 Rckt Lchr	- 7,884 2.75-inch Rockets
From the CH-47	- 22,000 RDS of 7.62mm

For a grand total of 1,696,852 RDS of 7.62mm and 11,394 2.75-inch Rockets.

We have two boats stationed at Apalachicola which we use to clear the range area and to stand by at the edge of the range for rescue purposes during firing. We also use an unarmed helicopter to escort the gunships while over the water.

At Apalachicola we have virtually exclusive use of the Apalachicola Municipal Airport. Only a few light civilian airplanes use the field. The three 5000 foot, hard-surfaced runways are in good condition. This airfield is available to the board without charge.

Our facilities there consist primarily of an operations trailer, two trailers for living quarters, a shelter for our vehicles, and ammunition storage bunkers, which were constructed for us as a training project by a Florida National Guard Engineer Unit.

Our Apalachicola test area is also used for testing other than firing. The Frankenstein Hangar is under a one year test at Apalachicola. Between 1 July 1967 and 15 March 1968, we flew the following number of test profile hours at Apalachicola:

CH-47	-	822
OH-6A	-	241
AH-1G	-	436
UH-1	-	1,144
U-21A	-	162

For A grand total of 2,806 hours

The city of Apalachicola has a relatively austere economy. It is unlike Panama City and Pensacola in that it is not a resort area.

Its shoreline does not have sandy beaches. It is a low-income fishing community which has welcomed the Aviation Test Board to its area, has helped us in many ways, and has asked nothing in return.

The Apalachicola test facility allows the board to conduct many of its test projects in a Southeast Asia-type environment. In a timely, unrestricted manner, and at very little expense.

We at the Aviation Test Board are very proud of our test and evaluation role in the Army's research, development, test and evaluation program. The ever-expanding role of Army aviation in Southeast Asia has increased the urgency of material developments to our combat operations there. We have keyed out testing to the priorities established by Army aviation in Southeast Asia. The test operations of our board cover the full spectrum of aviation material. We enjoy the fullest cooperation of the other members of the Aviation Center team here at Fort Rucker in achieving a total test of our new material.